# POWER

POWER GENERATION, TRANSMISSION, APPLICATION AND THE ATTENDANT SERVICES IN ALL INDUSTRIES

## MAY, 1943

**Plan coal storage now** to ease next Fall's railroad burden. For data on drag-scraper equipment, which offers a flexible solution to many storage problems, turn to page 66

**Going to sea?** Merchant marine still needs men with stationary engineering experience to officer new ships. Revised procedure and training program makes it easier to convert your shore skills to war-winning sea skills. Page 70

**Conversion** — Experience with shifts from oil to pulverized coal shows how to avoid capacity reduction and solve difficult layout problems. For these tips, and data on stoker conversions, see page 94

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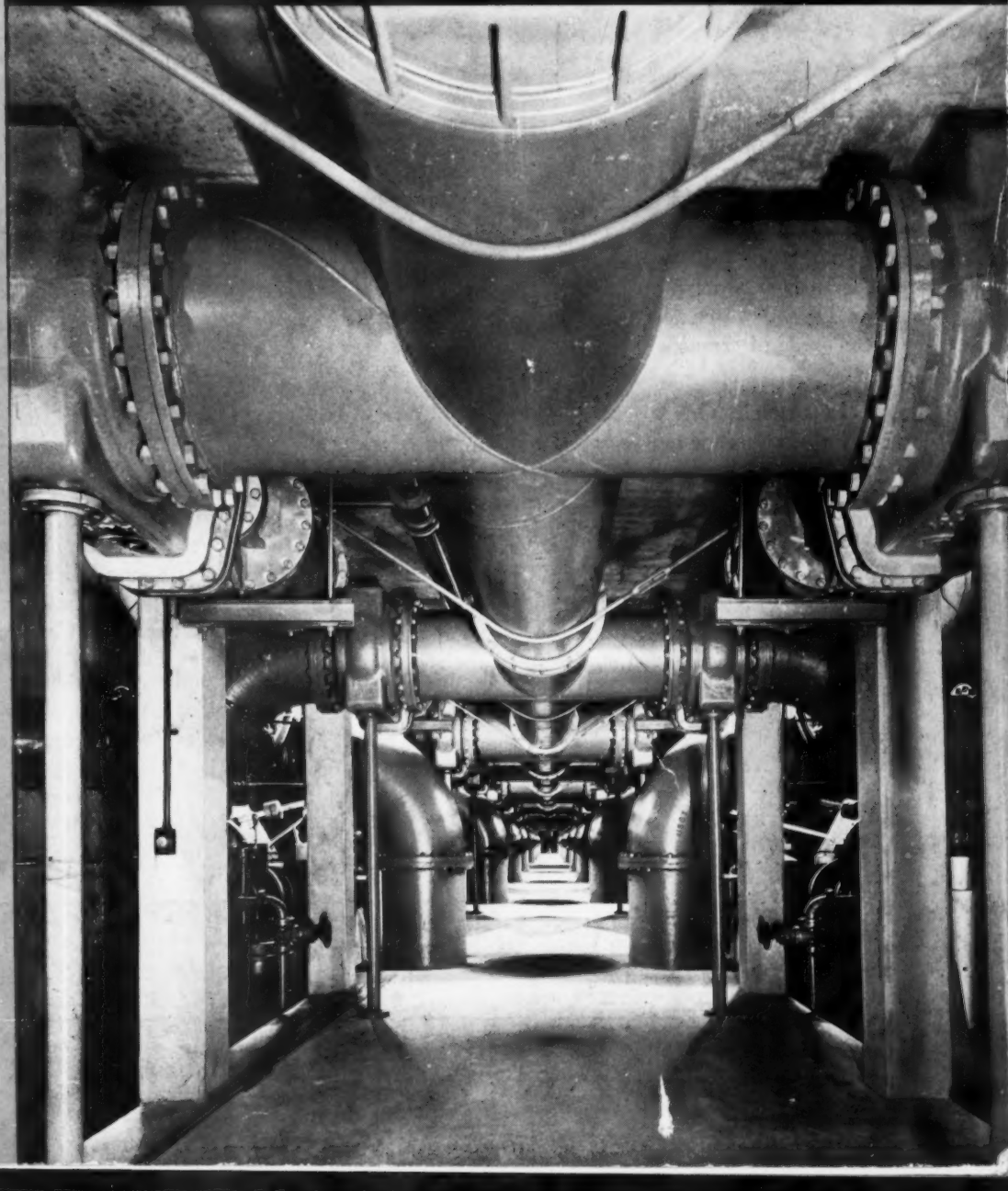
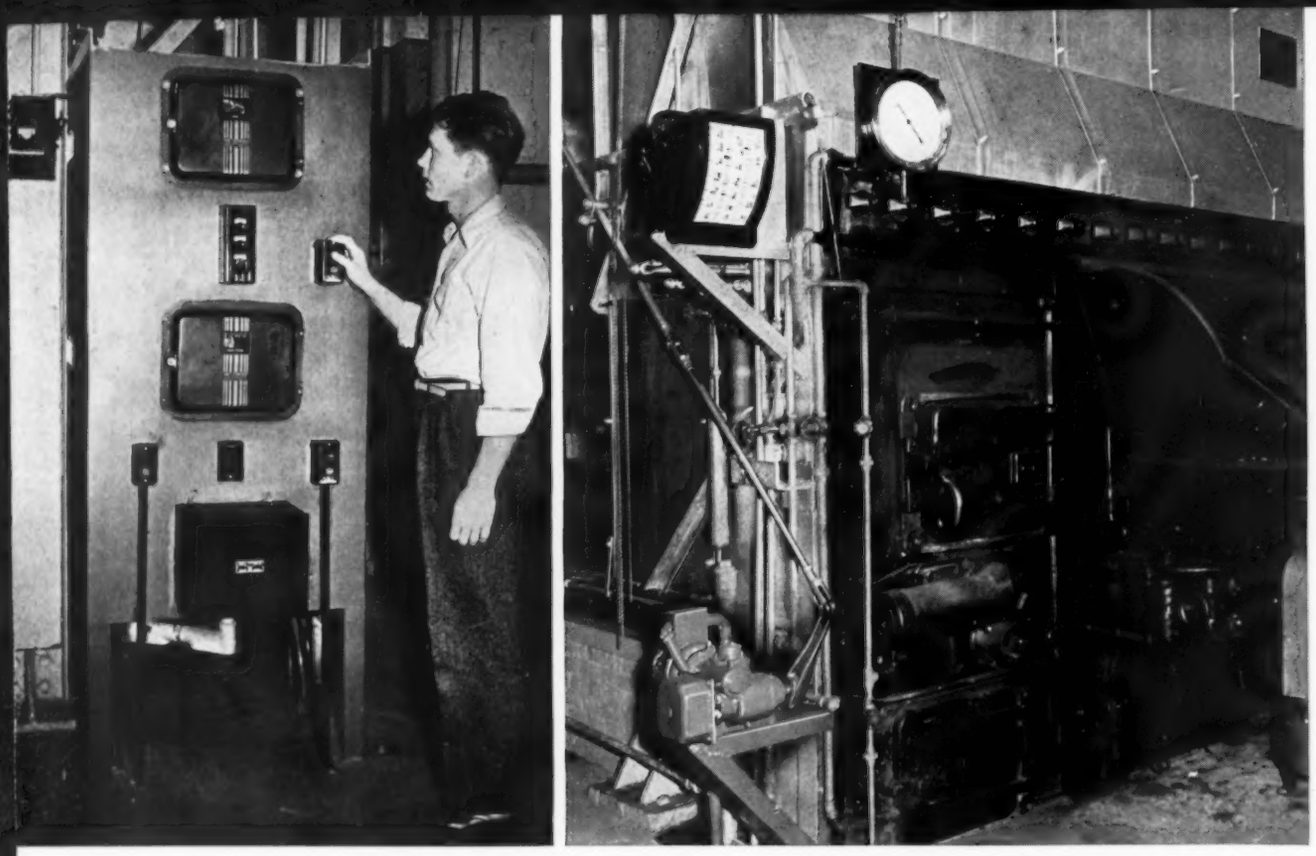
*Pipe bay in new 300,000-gpm Toledo pumping station—see June Power for description*





L&N Type P Combustion Control on a B & W Integral-Furnace Boiler. Control Panel at left arrives completely assembled and ready for outside connection; carries the Master Controller, Furnace Pressure Controller and all push buttons. A typical valve drive is the one for uptake damper, shown alongside the boiler.

# NEW COMBUSTION CONTROL SYSTEM Meets Needs of War-Busy Textile Plant

Shown here is a typical application of the entirely new L&N Type P Combustion Control system especially suited to the needs of "smaller" power plants and to many war plants:

1. It is simple. One Controller (the Master) regulates both fuel and air for all boilers. Another Controller (one for each boiler) regulates furnace pressure. Both are entirely electrical; they move the dampers, valves and levers by means of electric-motored Drive Units.

2. It is Centralized and Flexible. Without moving from Panel, operator can switch from fully-automatic control to either base-load or push-button control; can operate some boilers on automatic control and some on push-button; can change fuel-air ratio of any boiler or boilers. In brief, he can suit the operation to the plant requirements.

3. One Drive Unit for each damper, etc.; no piping or shafting; no interconnecting linkages; connections of Unit to Control Panel are through an electrical conduit. Drive Units cannot be back-driven even when power is off; and all but the smallest can be equipped with hand-wheel drives if desired. Only power is from 110-volt a-c lighting or similar circuit.

4. Type P is Easy to Install. With no compressors, piping or line shafting, the labor and time of installing are minimum. Our factory assembly of the Control Panel further reduces installation costs. We can supply panel individually, or as part of group panel, or on boiler board which includes both Control and instruments.

If you have a combustion-control problem which does not require central-station type equipment, outline the situation and we will promptly send specific facts about Type P Control.

Jrl Ad N-91P-163(3a)

LEEDS & NORTHRUP COMPANY, 4910 STENTON AVE., PHILA., PA.

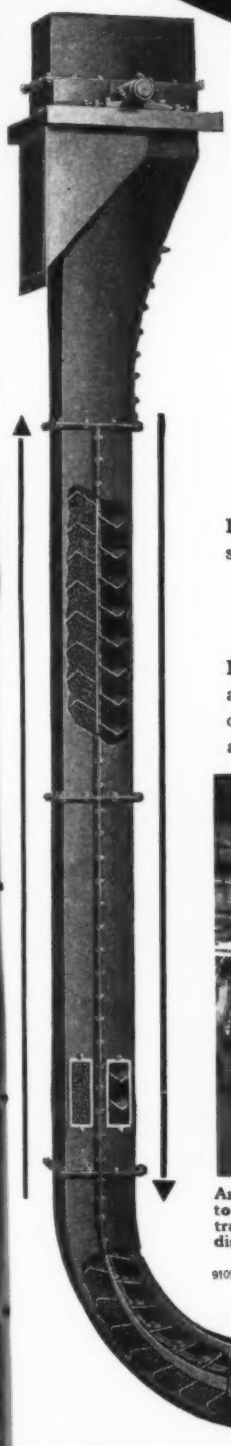
LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

**POWER** (with which are consolidated "Science and Industry," "The Engineer Review," "The Engineer," and "The Stationary Engineer"). May, 1943, Vol. 87, No. 5. Published monthly with an additional Directory number in December. Return postage guaranteed. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 North Broadway, Albany, N. Y. EDITORIAL AND EXECUTIVE OFFICES, 330 WEST 42ND STREET, NEW YORK, N. Y. Entered as second class matter, August 25, 1936, at Post Office, at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Power, 330 West 42nd Street, New York, N. Y. Subscription rates—U. S. and U. S. Possessions, $3.00 for one year, $4.00 for two years. Canada, $3.50 for one year, $5.00 for two years. Great Britain and British Possessions 36 shillings per year. All other countries $6.00 for one year, $9.00 for two years, 35c per copy.

# AN ELEVATOR, A CONVEYOR AND FEEDER IN A SINGLE UNIT

## Bulk-Flo CONSERVES IN MANY WAYS



Bulk-Flo is outstanding in its ability to cut handling costs and to conserve critical materials and save space. It minimizes breakage and degradation, prevents leakage and reduces explosion and fire hazards. The necessity for multiple elevating and conveying units is eliminated, because the same unit conveys horizontally, vertically or on an incline.

Bulk-Flo is self-feeding, self-discharging and to a high degree self-cleaning. It handles coal and other flowable materials under all conditions of loading. It loads automatically —at one or at several points—without feeders. It automatically discharges at the head end of vertical runs or at one or more points on horizontal runs, or both as desired.

**LINK-BELT COMPANY**

Chicago Philadelphia Indianapolis Atlanta Dallas San Francisco Toronto

Offices, warehouses and distributors in principal cities.

### Saves Space

Bulk-Flo is unusually compact, effecting a considerable saving in space requirements and supporting structure.

### More Flexible

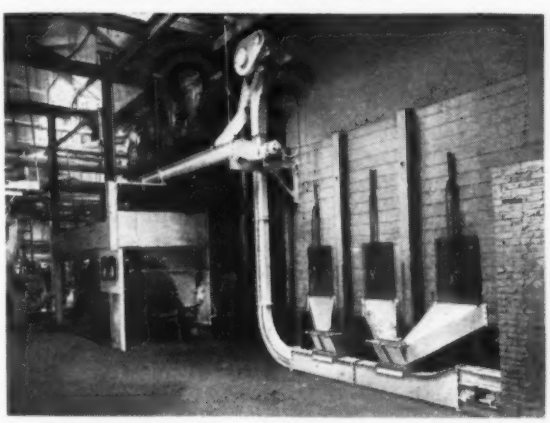
Bulk-Flo can be laid out to carry vertically, horizontally, around corners, along curves and on slants of any degree. Loading and discharge points can be located to suit. Tandem units can also be used.

### Self-Feeding, Enclosed

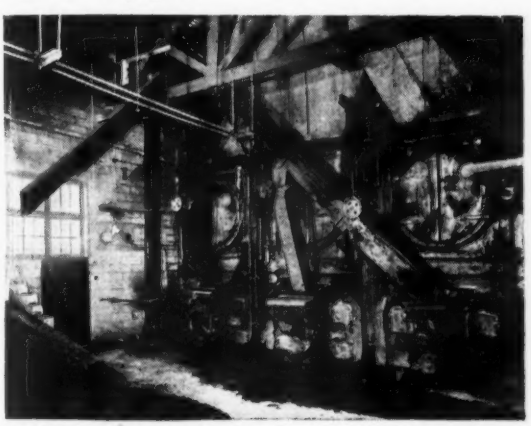
Bulk-Flo is self-feeding to capacity from bins, hoppers and chutes. It cannot flood. Material is moved in a dust-tight casing. It operates under partial loading with as high efficiency as when fully loaded.

### Slow Speed; Large Capacity

Because the material in a Bulk-Flo moves en masse, the speed is slow; usually 30 to 60 ft. per minute. Large capacities are obtainable by large duct cross section, rather than by speed.



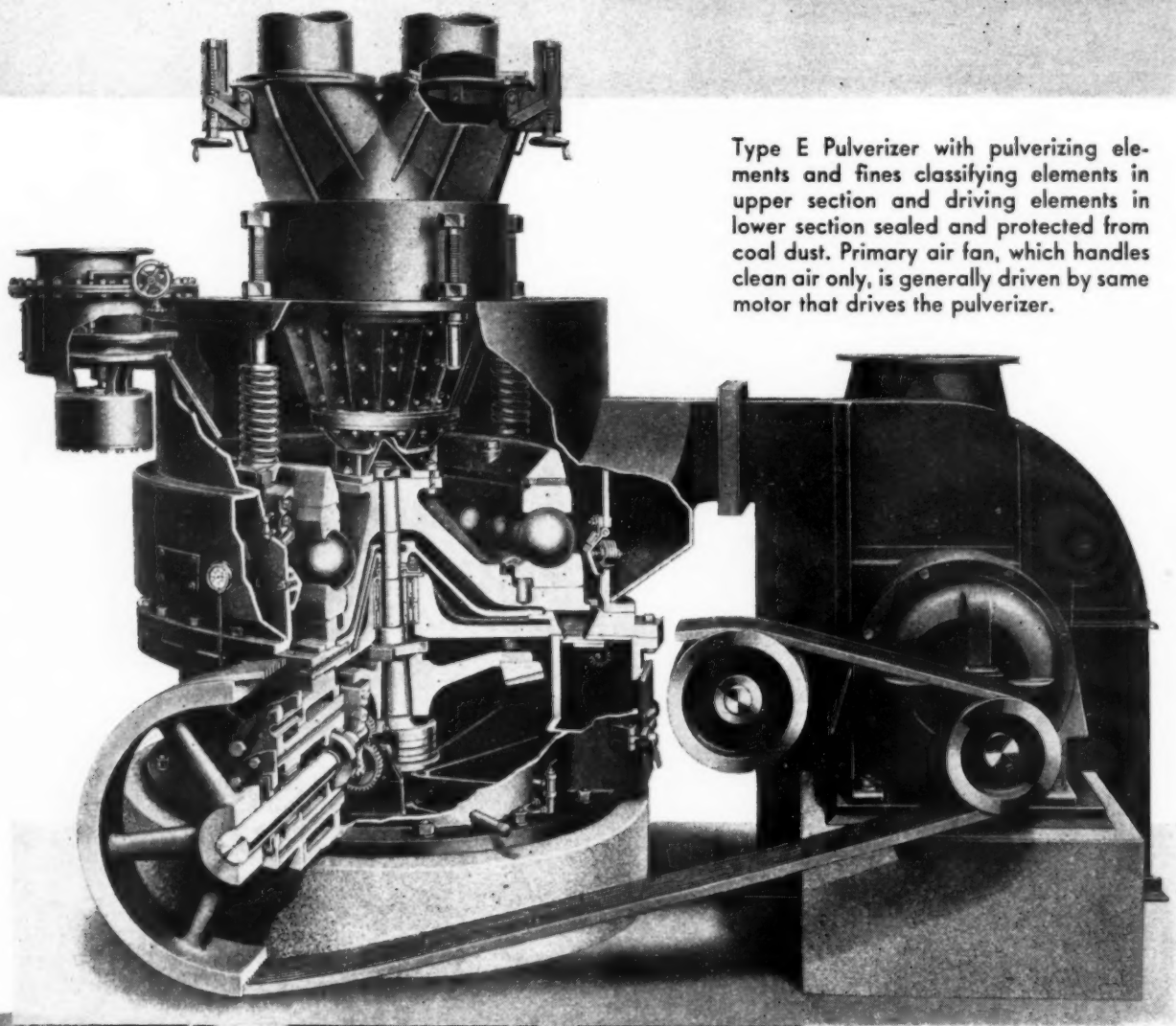
An interesting application of Bulk-Flo conveyor-elevator-feeder to the handling of coal in a plant power house. The Bulk-Flo transfers coal from bins near floor level to a screw conveyor which distributes it to stoker hopper.



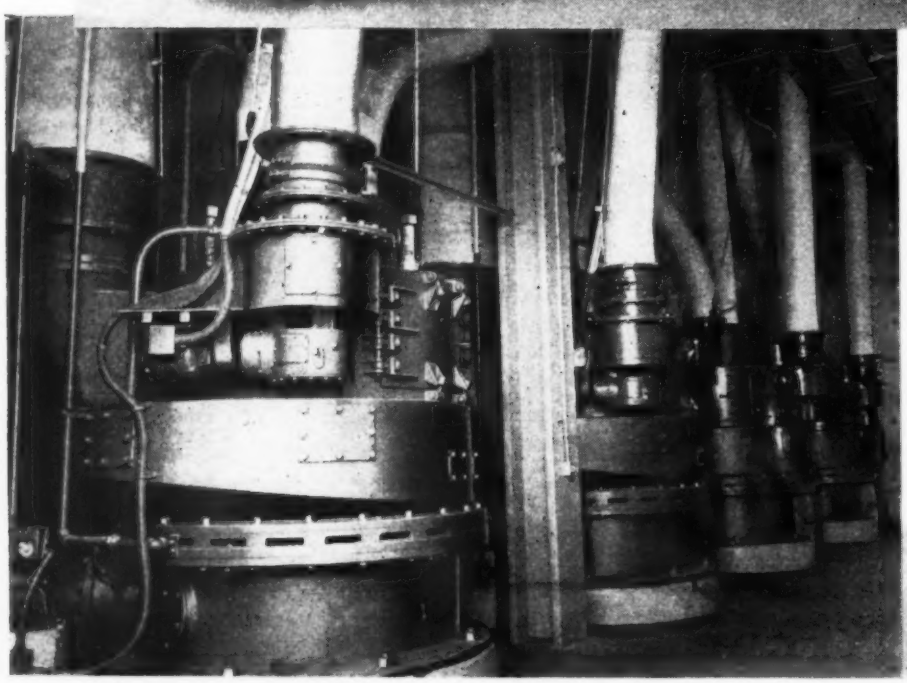
Vertical run of Link-Belt Bulk-Flo unit (left) in boiler room. 3-way chute system to three boilers and chute to reserve storage pile on floor. Bulk-Flo receives coal from hopper under railroad cars.

9105-A

# The B&W



Type E Pulverizer with pulverizing elements and fines classifying elements in upper section and driving elements in lower section sealed and protected from coal dust. Primary air fan, which handles clean air only, is generally driven by same motor that drives the pulverizer.



Over 400 Type E Pulverizers are in service or on order for direct firing boilers. Individual installations have as many as 16 units.

# Type E Pulverizer

## *Fits into Any Day's Fuel Picture*

### *Operates reliably and effectively in direct-firing pulverized-coal systems*

By every standard of direct-firing pulverizer performance, the Type E Pulverizer fits into the fuel economy picture any day, and especially so during the present emergency requirements.

**Type E Pulverizers—**

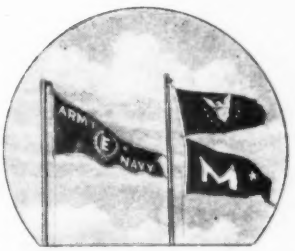
Are reliable in service and low in maintenance, as measured in service hours before replacement of parts becomes necessary.

Respond readily to load changes—output controlled at one point, the primary air damper, and are adoptable to fully automatic control.

Maintain fineness and capacity throughout life of grinding elements.

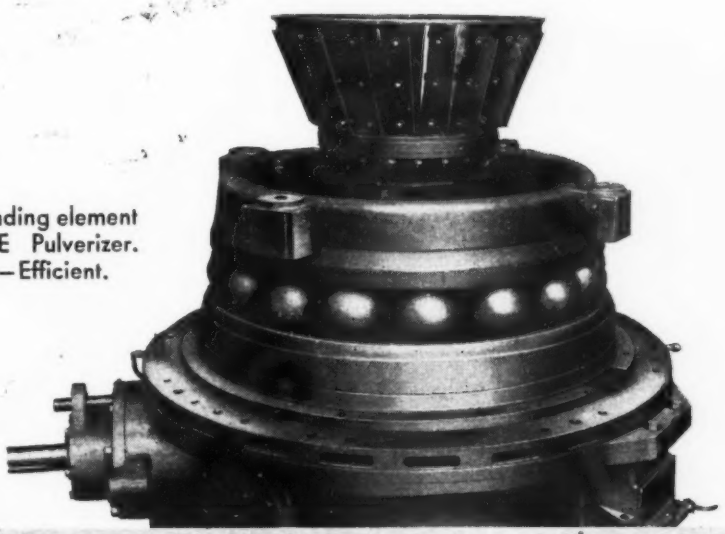
Handle coal of a wide variety and, due to drying in the mill, can handle coal with as much surface moisture as it will carry.

These and other features of the Type E Pulverizer are given in more detail in Bulletin G-30-A. Copies obtainable on request.




The Army - Navy "E" and Maritime Commission Award flags are floated proudly at the plant that builds Type E Pulverizers.

**THE BABCOCK & WILCOX COMPANY**
**85 LIBERTY STREET, NEW YORK, N. Y.**

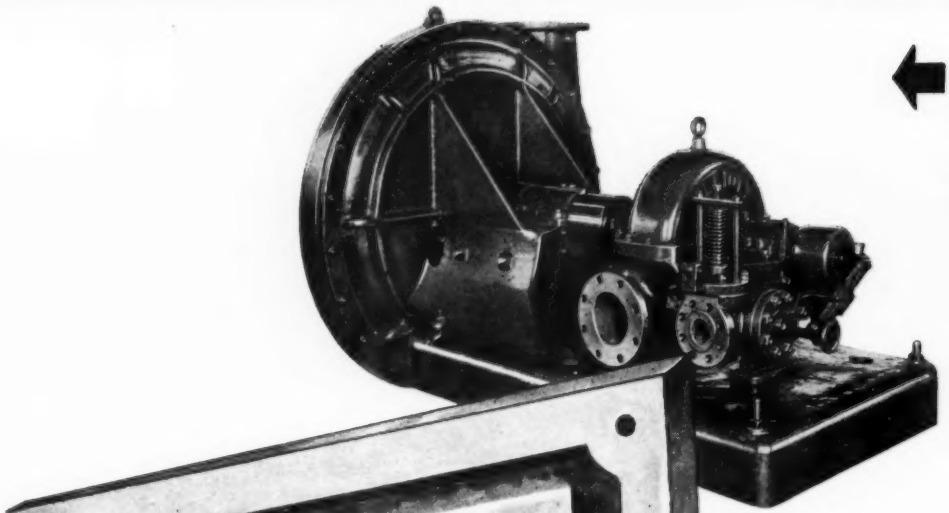


Ball-bearing grinding element of the Type E Pulverizer. Simple – Sturdy – Efficient.

For a copy of this bulletin return this pasted on a penny post card with your name and address.

# BABCOCK & WILCOX

G-244T



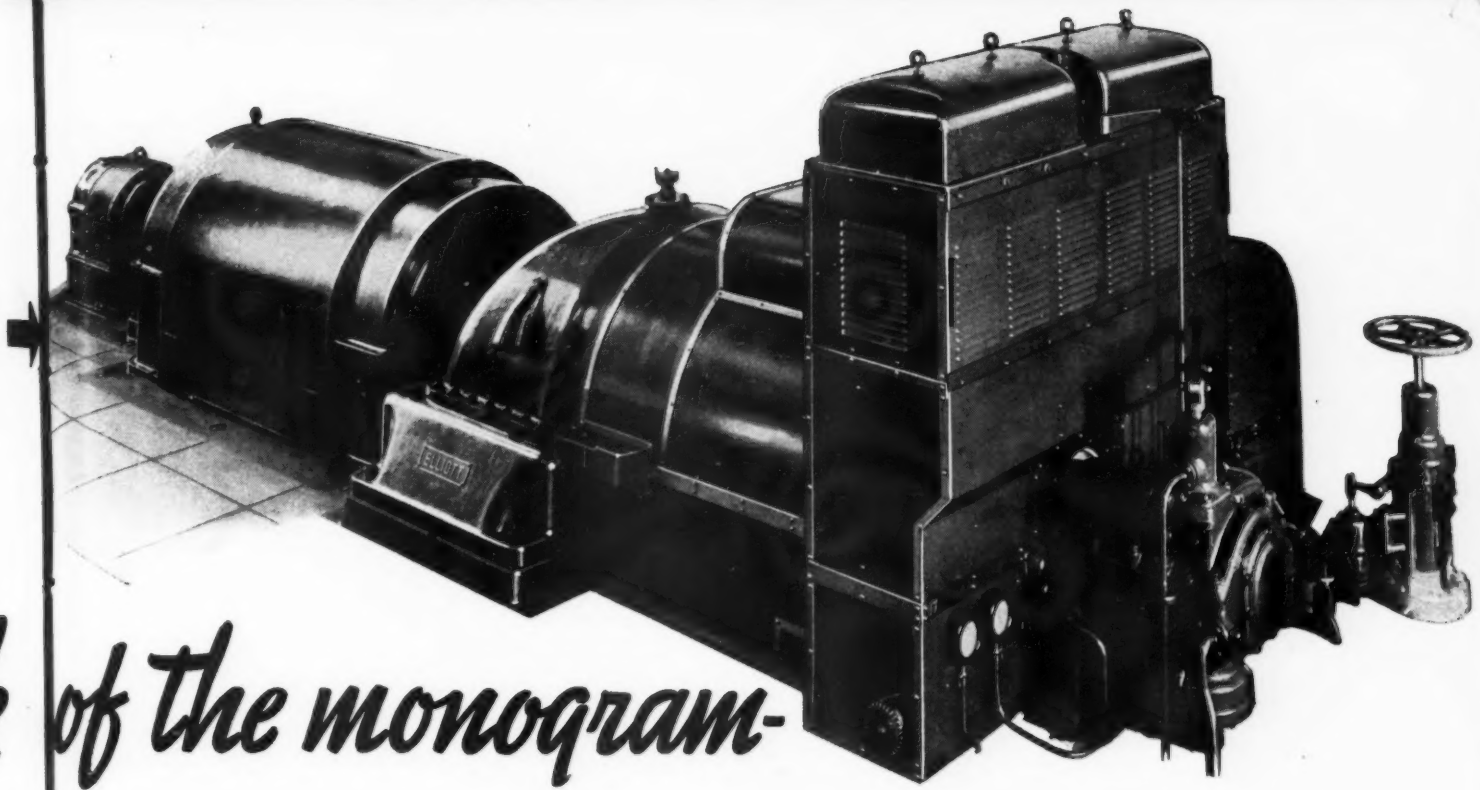
**ELLIOTT MECHANICAL DRIVE TURBINES** *are in use by thousands in refineries, process plants, power plants. The photo shows an Elliott turbine-blower unit widely used in war production processes. The blower is also built by Elliott.*

**ELLIOTT TURBINE-GENERATORS** *are serving in hundreds of central station and industrial power plants. The entire unit is Elliott-built.*

# *What's back of*

## A MARK OF AMERICAN INDUSTRY AT ITS BEST

# ELLIOTT



# ...of the monogram-in TURBINES!

The answer is, *DEPENDABLE POWER* — smooth, quiet, economical, reliable POWER which today is turning many of the wheels of war production. Power not only to make kilowatts, but also to drive blowers used in producing explosives, and synthetic rubber materials; to drive pumps for the production of the high octane gasoline our flyers are using so splendidly; to drive a variety of equipment which is bringing Victory nearer day by day.

The engineering background of Elliott turbines goes back to the beginning of the century. The progenitors of today's Elliott turbines first took shape almost forty years ago. Even then they were good units—some of these earlier turbines being rebuilt only recently, after a third of a century in service.

Elliott turbines today have advanced to their present standard of excellence through a process of conservative development. The result is turbines that can "take it," as they are doing in some of the toughest, most trying drive jobs there are.

**When you need turbines —either as units with their generators, or for mechanical drive—talk it over with Elliott.**

**The Army-Navy E has been awarded to both the Jeannette and the Ridgway plants of Elliott Company.**

H-673

## COMPANY

*Steam Turbine Department*

**JEANNETTE, PA.**

DISTRICT OFFICES IN PRINCIPAL CITIES

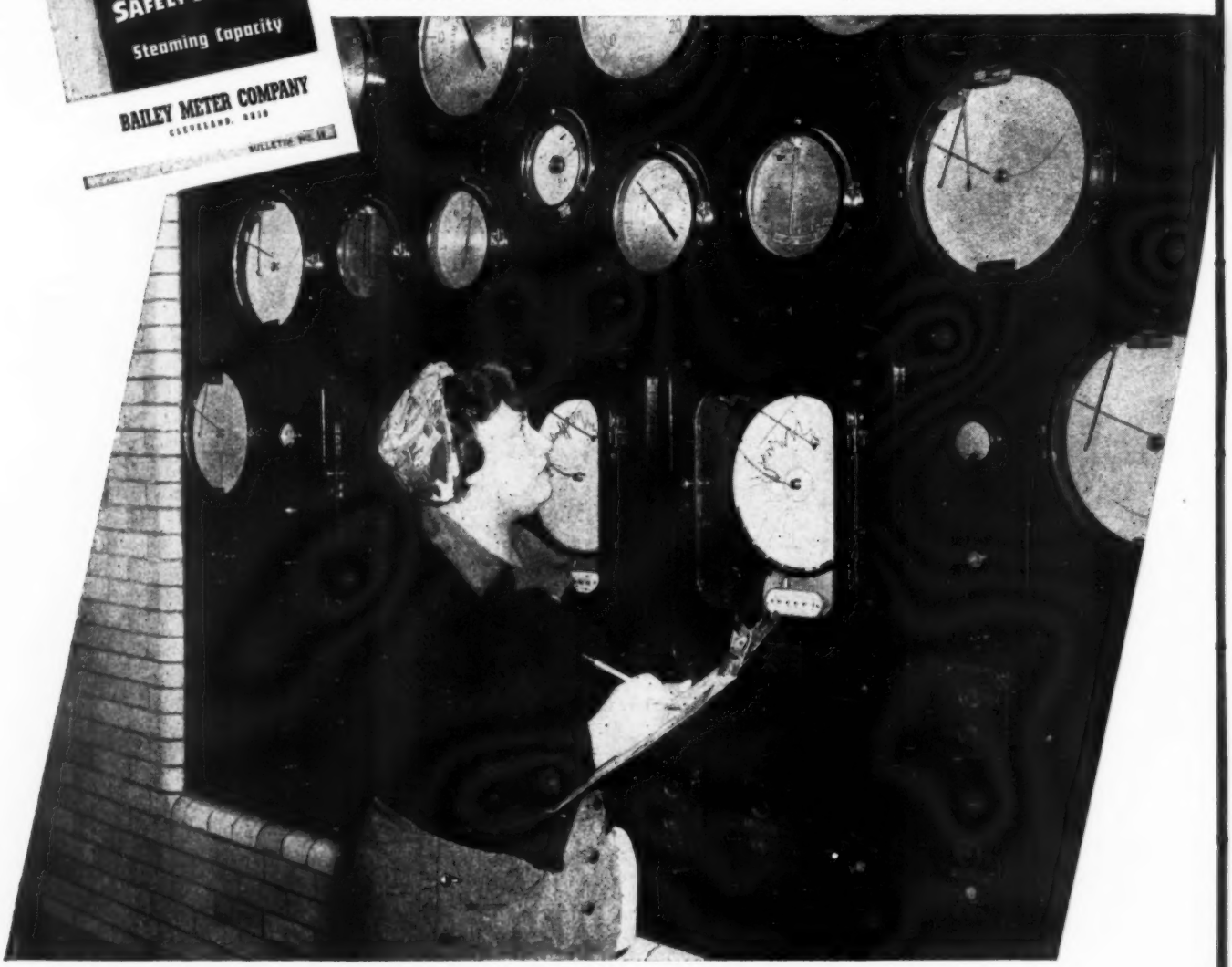
STEAM TURBINES • GENERATORS
MOTORS • STEAM JET EJECTORS
FEEDWATER HEATERS AND DEAERATORS
CONDENSERS • CENTRIFUGAL BLOWERS
TUBE CLEANERS • STRAINERS
TURBOCHARGERS FOR DIESEL ENGINES

# WHEN MANPOWER B

## Bailey Meters a
## Simplify Training a

*Send for this Bulletin, No. 16, which tells how to use meters and controls as a basis for daily operation.*

*One of a group of women now serving as operators in a Mid-Western Central Station.*



**BAILEY METER CONTROL**

BOILER METERS • MULTI-POINTER GAGES • FLUID METERS • RECORDERS • SUPERHE

# R BECOMES WOMANPOWER

## rs and Control Systems
## g and Operating Programs

★ When women come to work in the Boiler Room, Bailey Meters and Controls greatly simplify the training and operating programs. By making full use of this equipment, it is possible to maintain high standards of efficiency, continuity of service, and safety in spite of inexperienced operating crews.

New operators quickly learn to use the simple, direct information furnished by Bailey Meters. For example, the Bailey Boiler Meter shows when "too much" or "too little" excess air is being used, simply by the relation of its Air Flow pen to its Steam Flow pen. When Air Flow is above Steam Flow too much air is being used. When it is below, too little air is being used. When the pens coincide, ideal conditions prevail.

Bailey Control Systems go a step farther by interpreting the meter readings and automatically taking the necessary action to maintain ideal conditions. Complete combustion control with sequence interlocks, limit stops, and automatic readjustment of fuel—air ratio, insures the maintenance of fuel economy, uniform steam pressure, and safe combustion conditions. Bailey Feed Water Control likewise aids in securing uniform operation and guards against damage from high or low water.

A discussion on the use of meters and control systems as a basis for daily operation is contained in our Bulletin No. 16, "How to Safely Stretch Steaming Capacity." A copy of this bulletin will be sent to you upon request.

A-89

**BAILEY METER COMPANY**

1036 IVANHOE ROAD • CLEVELAND, OHIO

BAILEY METER COMPANY LIMITED • MONTREAL, CANADA

BAILEY METERS

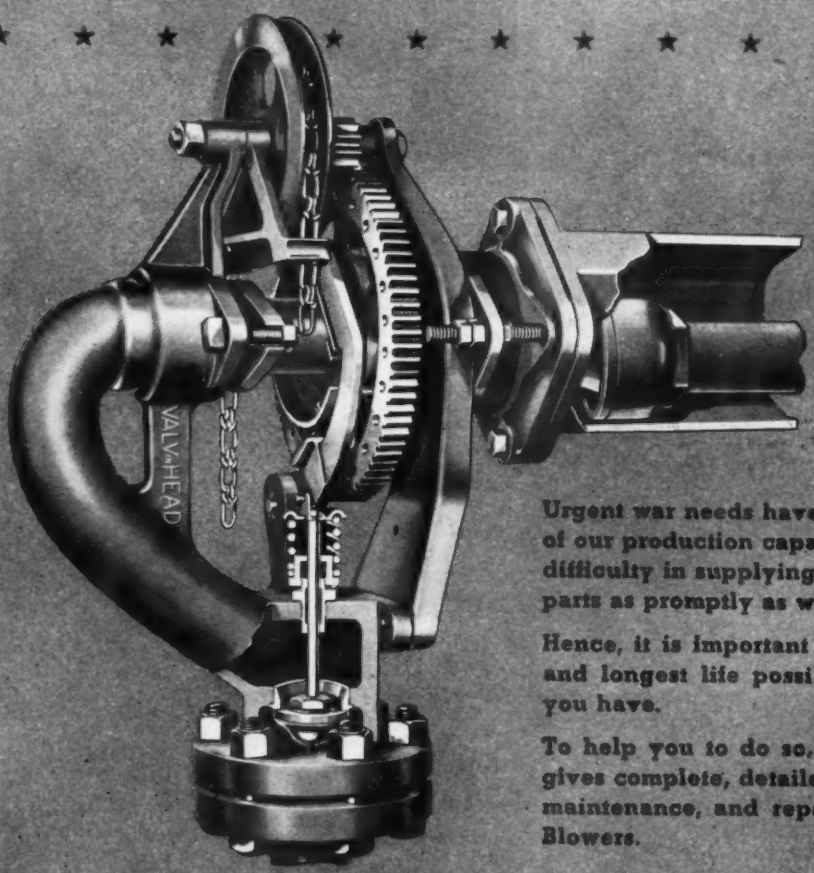
*• The Complete Combustion Control System*

ERHE ONTROL • DESUPERHEAT CONTROL • COMBUSTION CONTROL • FEED WATER CONTROL

# This Book

DIAMOND
VALV-IN-HEAD
Parts,
Maintenance,
and Operating
Instructions

# Enables you to GET MORE out of your Soot Blowers




Urgent war needs have absorbed a large portion of our production capacity. We often have great difficulty in supplying new soot blowers or repair parts as promptly as we'd like.

Hence, it is important that you get the best use and longest life possible from the soot blowers you have.

To help you to do so, we offer this book which gives complete, detailed instructions on the care, maintenance, and repair of Diamond G9B Soot Blowers.

## LET US SEND YOU A COPY—
## WE THINK YOU WILL FIND IT USEFUL

THROW YOUR *Scrap* INTO THE FIGHT

**DIAMOND POWER SPECIALTY CORP.**
DETROIT, MICHIGAN

DIAMOND SPECIALTY LIMITED • Windsor, Ontario

FOR CORROSIVE LOCATIONS. These oil-immersed combinations are made in two forms —for both corrosive and hazardous locations.
DUST-TIGHT COMBINATIONS. Available through NEMA size 5—these starters are for application in dusty locations
NEW HIGH-VOLTAGE COMBINATION. This provides split-cycle short-circuit protection and starting means for high-voltage motors.

# GENERAL ELECTRIC

676-93C-8490

HEY BILL!
YOU'RE DOUBLING YOUR WORK WHEN YOU INSTALL CONTROL THAT WAY!
EVER HEAR OF G-E COMBINATION MOTOR STARTERS?
BY using G-E combination starters, you can cut the time required to install motor control by 50 per cent. That's because "combinations" combine two controls—a motor-circuit switch (with short-circuit protection) and a magnetic starter—in one, compact, easy-to-mount unit.
But that isn't all—combination starters save critical material by eliminating unnecessary conduit; and they offer your operators better protection because the case door is interlocked with the safety switch.
Save man-hours and critical material by specifying General Electric combination starters. General Electric Company, Schenectady, N. Y.
WATERTIGHT COMBINATIONS For outdoor application and for installation in damp locations.
FOR HAZARDOUS LOCATIONS Enclosed in a high-strength, alloy case, these starters are ideal for Class 1, Group D, locations.
FOR GENERAL-PURPOSE USE These combinations are for indoor applications where atmospheric conditions are normal.

**OMBINATION STARTERS FOR MOTORS FROM 1 TO 1000 HP**

# ★ ★ ★ A New Pneumatic

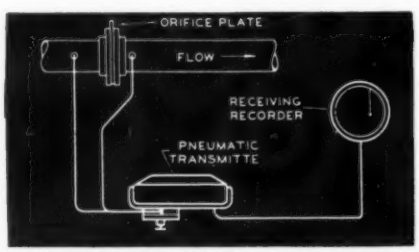
## FOR MEASURING FLOW AND LEVEL

### *Operating on the Force-Balance Principle*

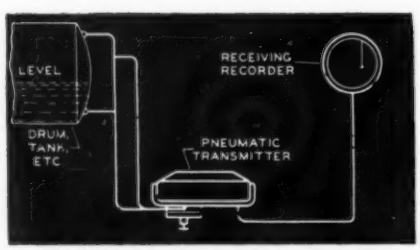
The Republic Differential Pressure Transmitter is an entirely new type of pneumatic meter which has been thoroughly field tested during the past two years. It is a simple pneumatic device for converting a differential pressure, such as is produced by the flow of a fluid through an orifice or by liquid level in a vessel, into an air pressure which varies proportionately with the differential pressure.

This air pressure is used as a direct measure of the differential pressure and can be conducted to a remote location by means of tubing. A gage or receiver connected anywhere in this transmission line will show the variations in the differential pressure and may be graduated in terms of the flow or level which it represents. The pressure can also be utilized as the impulse for actuating a controller.

The Republic Pneumatic Transmitter operates exactly like a weigh scale. The force of the differential pressure on a measuring diaphragm is the value being weighed. This force, multiplied by its lever length, is balanced by the force on a reaction diaphragm times its lever length. The pressure on the reaction diaphragm represents the weights used on a scale and is merely a means of automatically accomplishing this weighing process and transmitting the results.




*Typical installation for measuring flow.*




*Typical installation for measuring liquid level.*

**RANGES**—standard ranges are available from 0.9 in. to 25 in. of water differential, for working pressures up to 15 psi.; 7 in. to 50 in. of water for working pressures up to 25 psi.; and 13 in. to 800 in. of water for working pressures up to 600 psi. Special heads can be provided for working pressures up to 2000 psi.

**RANGE EASILY CHANGED**—the range of a Republic transmitter can be readily changed by making a few minor adjustments or substituting a few simple parts. For example, a transmitter with a differential range of 50 in. of water can be changed to any range up to 100 in. of water by merely changing the position of the reaction diaphragm.

**DIAPHRAGM MATERIAL**—diaphragms for the Republic transmitter can be made from practically any material including rubber, synthetic rubber, Saran, brass, stainless steel, Monel, silver, etc. This is possible due to the extremely small motion required. (.010 in. for full scale reading). The material is specified in accordance with the solvent or corrosive action of the measured fluid.

●

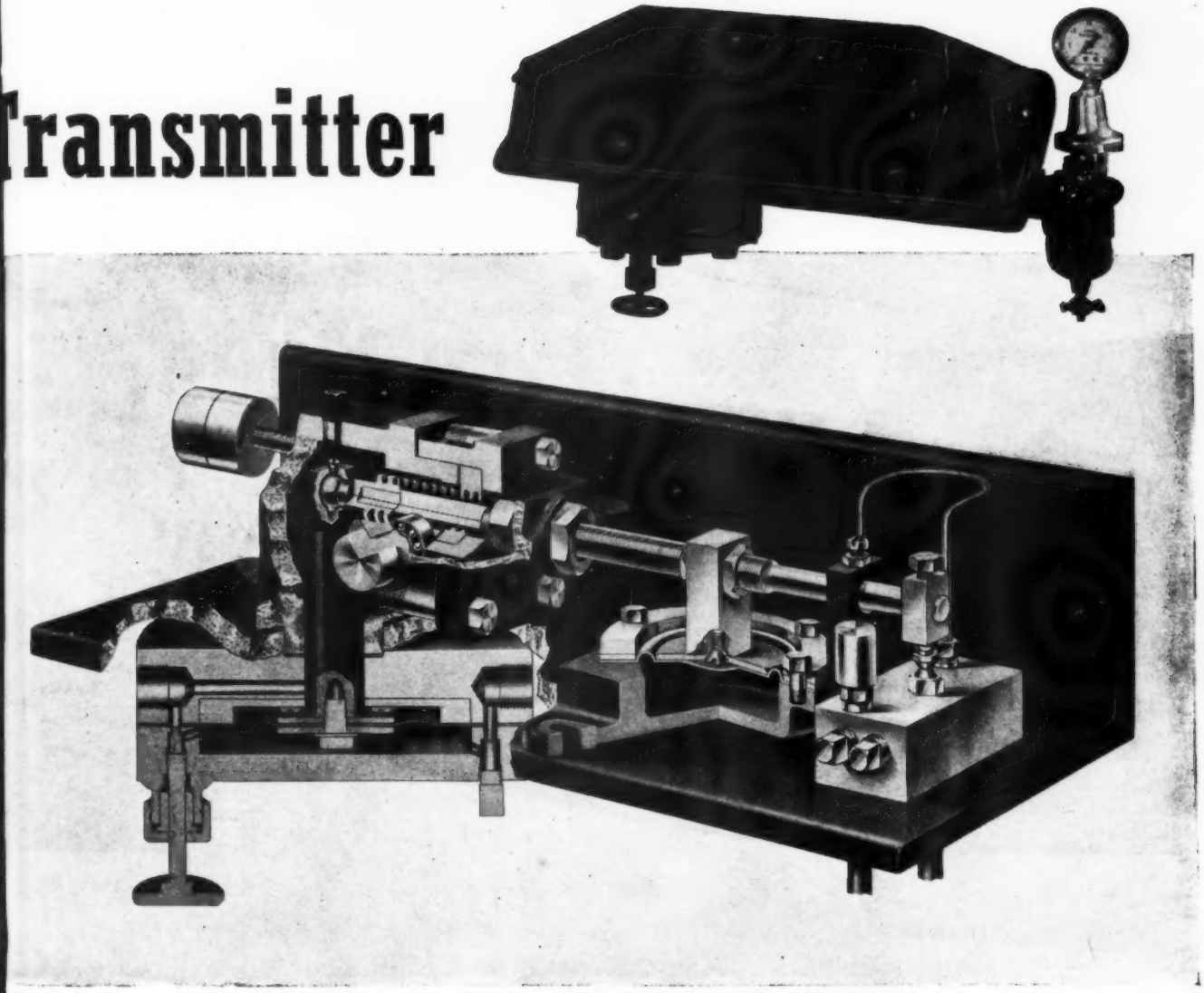
***For complete details write for Bulletin No. 43-4***

REPUBLIC INSTRUMENTS AND CONTROLS

# REPUBLIC

**2222 DIVERSE**

# ti transmitter



*Exterior and cut-away view of the Republic Pneumatic Transmitter.*

## PERFORMANCE FEATURES

**ACCURACY** of the Republic force-balance method of measurement is higher than can be consistently secured and maintained with any other method. Transmitting pressure vs measured differential is guaranteed within ½ of 1% of meter range.

**SENSITIVITY** — due to the negligible motions required for complete operation of all parts for full scale change, no appreciable hysteresis results from reversal of direction of measurement change. The hysteresis loop is so small that it is undetectable by ordinary means, being less than 1/20 of 1%.

**RESPONSIVENESS** — due to the fact that there is virtually no volume displacement, the Republic Pneumatic Transmitter is able to follow flow changes almost instantaneously. The time required to produce full output pressure at the transmitter is in the nature of fractions of a second, after the differential is imposed. Therefore a receiving instrument installed adjacent to the transmitter will show flow changes almost instantly. With 500 feet of ¼ in. O. D. tubing, the full value of the change will have registered on a Republic receiver in 15 seconds. This is the overall lag in the system not merely the transmission lag.

**NO TEMPERATURE EFFECT** — the effect of ambient temperature variations on the accuracy of a Republic transmitter is negligible. Since all parts are equally affected by temperature changes, force and leverage relationships are not disturbed and accuracy is unimpaired.

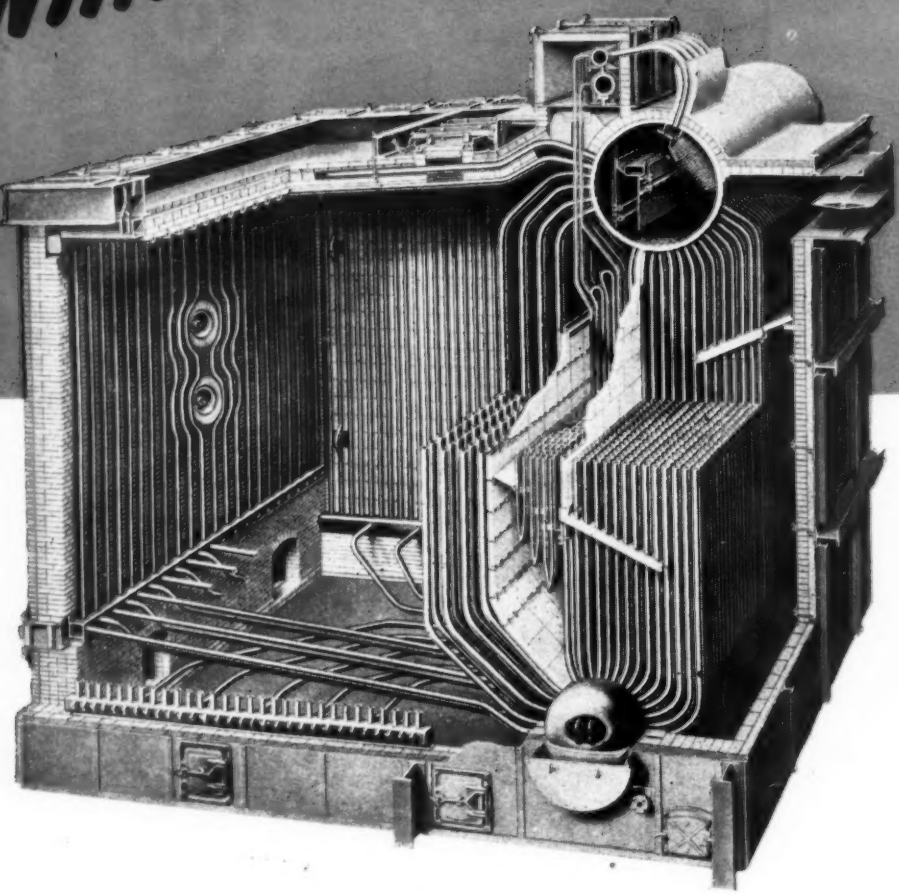
**NO VIBRATION EFFECT** — the Republic transmitter is unaffected by any normal frequency of vibration ordinarily encountered in industrial or process plants.

**AIR CONSUMPTION** — the air consumption of the pneumatic system is .20 cfm. maximum at 20 psi. supply pressure, when differential is zero. At maximum differential consumption is zero and is inversely proportionate to intermediate, differentials.

# FLOW METERS CO.

ARKWAY • CHICAGO • ILLINOIS

# IN CONTINUOUS OPERATION FOR



Sectional view of a C-E Steam Generator, Type VU, which is the type of unit responsible for the notable performance record appearing on the opposite page. The unit referred to has a maximum continuous capacity of 131,000 lb of steam per hr. Design Press.—250 psi.

## COMBUSTION ENGINEERING

# ...RTS FIRST 9 MONTHS OF SERVICE ★

## another Victory Unit speeds war production

Here's the most recent VU Steam Generator to prove the aptness of its wartime name – Victory Unit*. In a large Canadian aluminum plant, which is operating at full speed to produce increased quantities of its vital product, this VU Unit was first placed in service during March 1942. It was taken off the line for its *first* inspection in December 1942 *after 9 months of continuous operation.*

During this entire period the Victory Unit, designed for 131,000 lb maximum continuous ouput, generated an average of 120,000 lb of steam per hr. The peak load was 155,000 lb of steam per hr which was sustained for relatively long periods as is indicated by *average daily outputs* as high as 133,000 lb of steam per hr.

The inherent quality of the VU Unit is demonstrated by the report of the company on the findings of the first inspection. The boiler was in exceptionally good condition. Drum, tubes and headers were free of scale and very clean except for a slight sludge deposit which was easily washed out.

The furnace, boiler passes and preheater were so clean that they required but little attention. Except for repacking of valves and the normal replacement of those mill parts subjected to severe wear, no repairs were necessary.

Thus the design features of the VU Steam Generator and the quality of its construction help once again to minimize "time out" for inspection and maintenance so that the production of a vital war commodity may continue apace. Hence the appropriateness of the wartime name – Victory Unit. A 727

*Labelled The Victory Unit many months ago by a member of our Engineering Department who was impressed by the number of these units going into war plants.

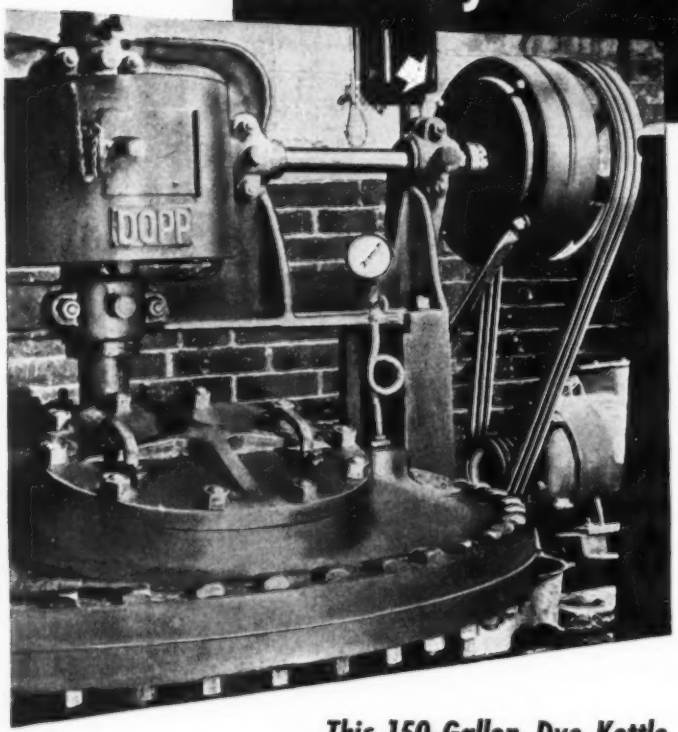
**200 MADISON AVENUE, NEW YORK, N. Y.**

*Canadian Associates*

COMBUSTION ENGINEERING CORPORATION LIMITED

Montreal Toronto Winnipeg Vancouver

# When you need a Speed Reducer

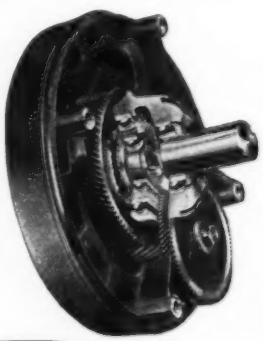



### This 150-Gallon Dye Kettle

was formerly driven at 45 R.P.M. by a silent chain drive and an open gear drive. Starting load was extra heavy and shock loads were frequent. The machine had to take some real punishment. Maintenance costs went sky-high. Shut-down time was excessive. The user solved those problems with an American Reduction Drive—using a primary Wedgbelt Drive which effectively "cushioned" the starting and shock-loads—thereby reducing maintenance costs to a minimum.

### Below 154 R.P.M. . . .

A standard speed ratio of 13-to-1 is produced by the assembly of 4 helical gears—running on ball bearings in patented frame that provides the proper strength/weight ratio—enclosed in a lightweight, oil-tight pressed-steel housing.



### Write For Complete Handbook

*Newly-revised, graphically illustrated—this informative handbook will give you all the data you need to select American Reduction Drives for your low-speed machines. Typical installations—specific applications—selection tables—full instructions are given. Your copy will be mailed on request.*

**The American Pulley Company**
PHILADELPHIA, PENNSYLVANIA

## This Compact Speed Reduction Drive

- ✓ *Cuts maintenance time!*
- ✓ *Insures top efficiency!*
- ✓ *Saves floor space!*

Light in weight, low in cost—The American Reduction Drive is a stock item available in six standard sizes to fit any job from ¼ to 25 H.P. Offers exceptional economy to users of slow-speed machines—mixers, feeders, agitators, conveyors and many other types of equipment.

Since the speed-reducing unit of the American Reduction Drive mounts directly on the shaft of the driven machine, costly foundations are eliminated. Valuable floor space is saved. Critical materials conserved.

Any motor can be used with this efficient reduction drive. With motors difficult to obtain, that's particularly important today. Moreover, maintenance is no problem at all—the *belt* absorbs the impact of shock loads and acts as a "cushion" between motor and gears!

The right speed you need—anywhere from 11 to 154 R.P.M.—is accurately, automatically delivered by the reduction unit's standard 13-to-1 ratio, when used with the proper American Flat-belt or V-belt drive. Substituting pulleys of different diameters instantly changes the output speed.

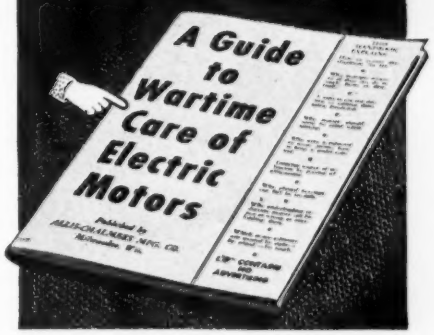
By specifying the American Reduction Drive you can lower your maintenance costs and give your machines the high efficiency you want. Get full information now.

Navy "E" for excellence awarded Feb. 12, 1942

# Some Job to Keep Motors Rolling at This Rate!

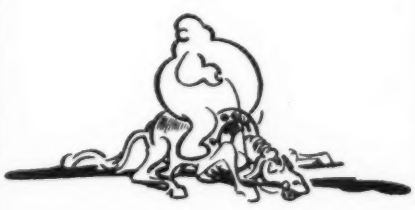
*'ROUND THE WORLD EVERY 8 DAYS — That's the rim travel of a rotor in many electric motors working on the new 24-hour-a-day, 7-day-a-week "suicide schedule"!*

**Now that U. S. motors are working up to 3 and 4 times as many hours a year as in peacetime, they need wartime care! Send in to Allis-Chalmers for your free copy of "A Guide to Wartime Care of Electric Motors." It's packed with the new data you need today!**




## HERE ARE THREE OF A MOTOR'S MOST DANGEROUS ENEMIES . . .

**1. Overload**—Now that motor overrating is U.S. policy, a closer eye than ever

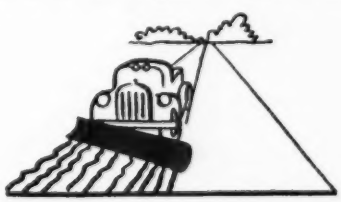


must be kept on a motor's overload protection. Like an overloaded horse, a motor worked too far beyond its horsepower capacity is sure to break down. See page 16 of "A Guide to Wartime Care of Electric Motors" for helpful tips. Already, wartime industry is using over 80,000 copies of it!

**2. Friction**—Standard peacetime instructions for guarding motors against friction were based on 8-hour-a-day, 7-day-a-week operation. Those instructions are dangerously obsolete today! All your maintenance men

should read the articles on "Dust" and "Friction" in Allis-Chalmers' new motor maintenance guide. It's profusely illustrated (with easy-to-understand sketches like these above).

**3. Uneven Wear**— Just as "rutting" is fought in road maintenance, "grooving" must be fought in *motor* main-



tenance. For on commutators and slip rings, smooth and even wear is *slow* wear. Every man in your maintenance department should know "A Guide to Wartime Care of Electric Motors" forward and backward. Send in today for *your* free copy to ALLIS-CHALMERS MFG. CO., Milwaukee, Wis.

**ALLIS-CHALMERS**

WE WORK FOR VICTORY — WE PLAN FOR PEACE

A 1390

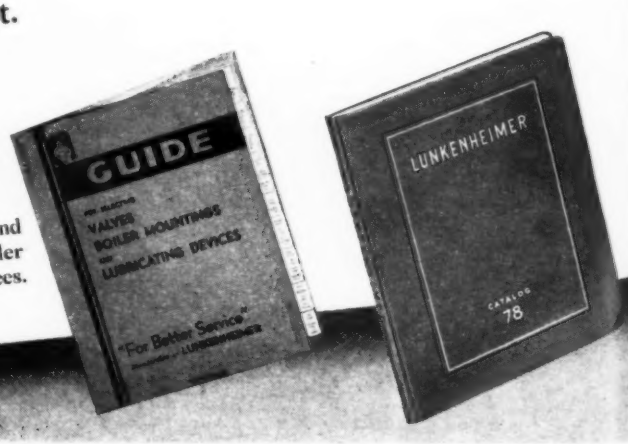
# AVOID this Costly

Valves aren't easy to replace these days . . . practically all materials going into their manufacture are on the critical list.

This means that it is up to every valve user to take the best care of what he has,to insure the longest possible service life.

Leaky valves are saboteurs of your production schedules . . . obstructing your best efforts and increasing your costs. The chart illustrated at the right gives you an idea of what valve leakage costs you . . . not to mention the lowered efficiency of your operations.

Fortunately, valves respond to good treatment. Careful handling, immediate repair of the slightest leaks, and prompt replacement of worn parts will keep them on the job, ready to meet the demands imposed by industry's unprecedented war effort.




Ask for Lunkenheimer Catalog 78 and the Guide for selecting Valves, Boiler Mountings and Lubricating Devices.

# Valve Leakage

| AREA OF LEAK | AIR | | STEAM | | WATER | |
|---|---|---|---|---|---|---|
| Diameter Inches | Number of cubic feet per month at 75 lb. pressure | Total cost of waste per month 11c per 1000 cubic feet | Pounds wasted per month at 160 lb. pressure | Total cost of waste per month 65c per 1000 lb. | Gallons wasted per month at 60 lb. pressure | Total cost of waste per month 16c per 1000 gallons |
| 1/2" | 13,468,000 | $1,481.44 | 1,219,280 | $792.53 | 1,524,100 | $243.86 |
| 3/8" | 7,558,500 | 831.44 | 684,290 | 444.79 | 855,360 | 136.86 |
| 1/4" | 3,366,990 | 370.37 | 304,820 | 198.13 | 381,020 | 60.96 |
| 1/8" | 824,570 | 90.70 | 74,650 | 48.52 | 93,310 | 14.93 |
| 1/16" | 213,000 | 23.43 | 19,280 | 12.53 | 24,110 | 3.86 |
| 1/32" | 52,910 | 5.82 | 4,790 | 3.11 | 5,990 | .96 |

Enlarged copies of chart available on request.

ESTABLISHED 1862

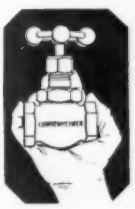
THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI, OHIO. U. S. A.

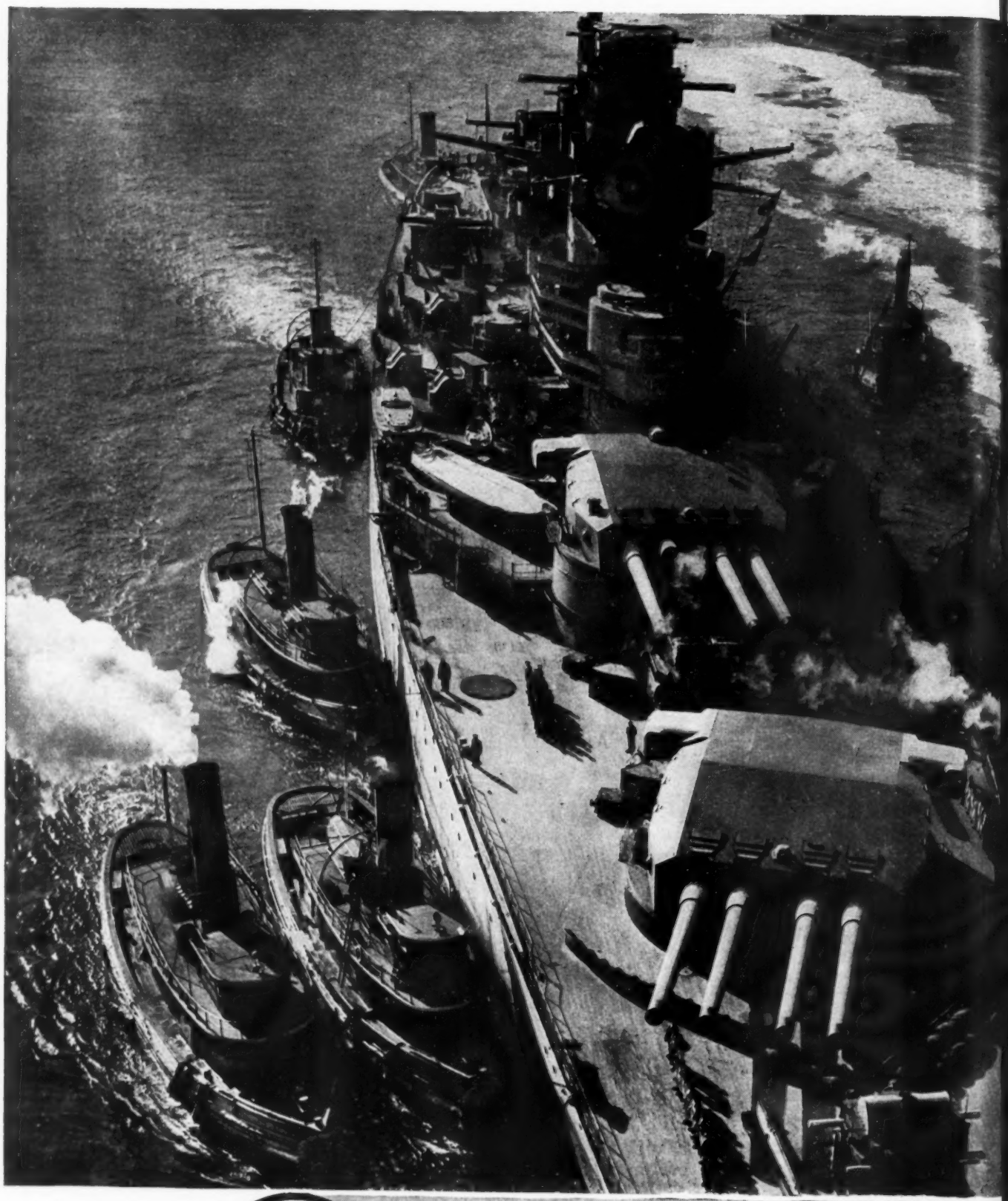
NEW YORK CHICAGO
BOSTON PHILADELPHIA

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK



BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

No. 28-101X-42



TEXACO

REG. T. M.

# TEXACO

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS

# Pushing a BATTLESHIP AROUND

SWINGING the giant 35,000-ton French battleship Richelieu through busy harbor traffic and warping her into position at her berth is a workaday job for sturdy, pugnacious tugs...many of them, Diesel-powered.

To make certain of sustained, full-output from their Diesel engines, operators, afloat and ashore, lubricate them with *Texaco Ursa Oil.*

*Texaco Algol* or *Ursa Oils* keep Diesel engines *clean,* free from harmful gum, sludge and carbon deposits. Their use assures long life of bearings and liners, free rings, compression-tight piston seal, full power, and *fuel economy.*

Because of Diesel operators' success with it —

***More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.***

So effective have Texaco Lubricants proved that they are definitely preferred in many other important fields, a few of which are listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd St., N. Y., N. Y.

**THEY PREFER TEXACO**

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined

★ More locomotives and railroad cars in the U. S are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

# Lubricants and Fuels

## FOR ALL DIESEL ENGINES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

# *Here's* DEPENDABLE POWER

## . . . the kind of power that will always win your war of production

War-time production needs and fuel shortages have served only to emphasize the necessity for a dependable source of power in the boiler room. Contracts for tools of war have gone to those who can PRODUCE WITHOUT INTERRUPTION . . . the same procedure will prevail when the time comes to turn out the products of peace.

"F&E" Underfeed Stokers have proved their ability to provide this dependable power. "F&E" engineers recognized this need years ago . . . and today thousands of "F&E" installations—in practically every type of boiler room—using practically every grade of coal—give evidence that "F&E" Stokers fulfill the most exacting requirements. Efficiency, economy and low maintenance rule.

Specify "F&E" Underfeed Stokers and get EXTRA dividends from your boiler room.

**FLYNN & EMRICH CO.**

Established 1842

HOLLIDAY & SARATOGA STS., BALTIMORE, MD.

Representatives in Principal Cities

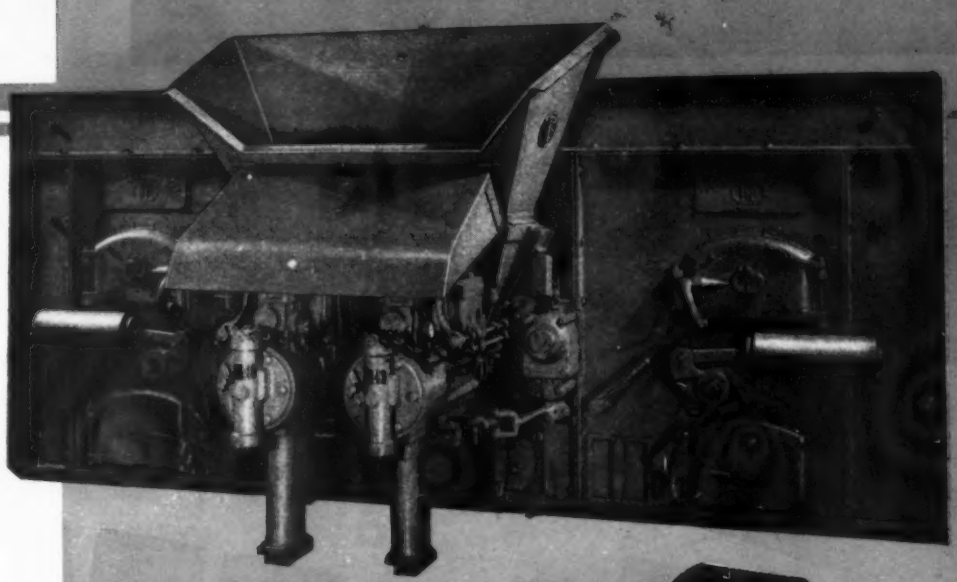
### ONLY "F&E" GIVES YOU THIS COMBINATION OF FEATURES THAT ASSURE PERFECT COMBUSTION

1. Electro-Hydraulic Drive — Foolproof and dependable—only 5 moving parts.
2. "F&E" Interval Timer Governor (patented)—Provides perfect control of fuel feeding rates.
3. Retort Sliding Bottom — Assures even fuel distribution.
4. Exterior Fuel Bed Regulator—Permits Adjustment of Burning Fuel Bed.
5. Removable Ram Case Liner—Reduces Maintenance — Eliminates Shutdowns During Replacement.
6. High Efficiency Tuyeres—Scientifically Designed; made of Special Heat-Resisting Metal.

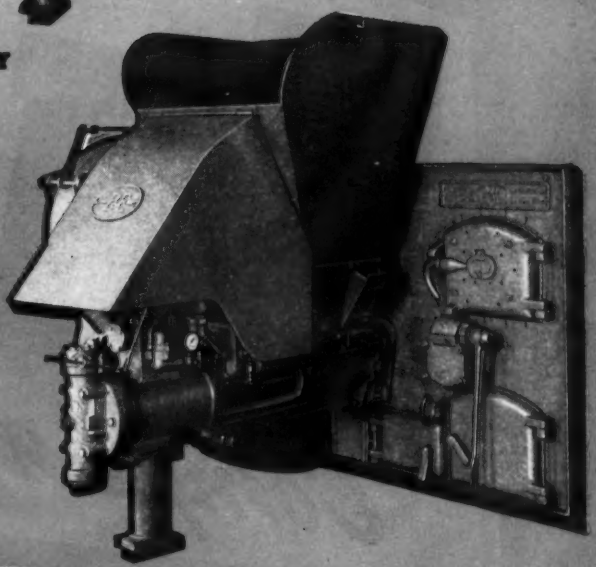
## A FEW COMPANIES WHO DEPEND ON "F&E" STOKERS FOR POWER

Public Service Co. of N. J.
*Revere Copper and Brass Co.
*Stauffer Chemical Co.
*Ohio Crankshaft Co.
High Standard Mfg. Co.
*Hydraulic Press Mfg. Co.
Cleveland Crane & Engineering Co.
*University of Alabama
*Eastern Rolling Mill Co.
*Brockway Glass Co.
R. J. Peacock Canning Co.
*Greenfield Tap & Die Co.
*Hoffman-La Roche Inc.
Vick Chemical Co.
*Flintkote Co.
National Grain Yeast Co.
Consolidated Laundries Corp.
*John Wanamaker
*American Stores
*S. Austin Picking Paper Co.
*American Cyanamid Co.
*Pratt & Whitney Aircraft Corp.
*Edgewood Arsenal
*Aberdeen Proving Grounds
*R. C. A. Manufacturing Co.
*The Ruberoid Co.

**Indicates repeat orders.*

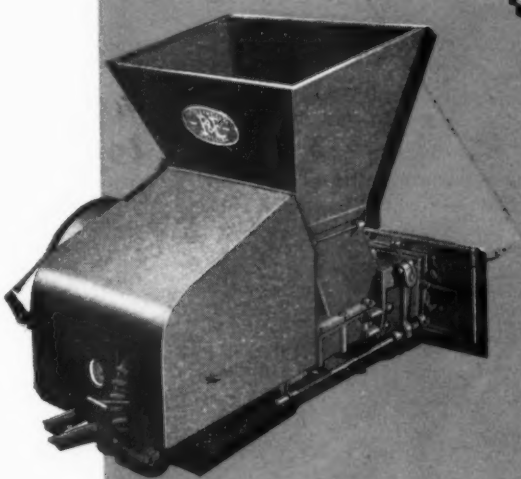


**THE "F&E" HEAVY DUTY SERIES 70**
For boilers generating from 10,000 to 40,000 lbs. of steam per hour.



**THE "F&E" SERIES 60**
For boilers generating from 4,000 to 12,000 lbs. of steam per hour. Anthracite and bituminous types.

**THE "F&E" SERIES 40**
For boilers generating from 750 to 5,000 lbs. of steam per hour. Anthracite and bituminous types.

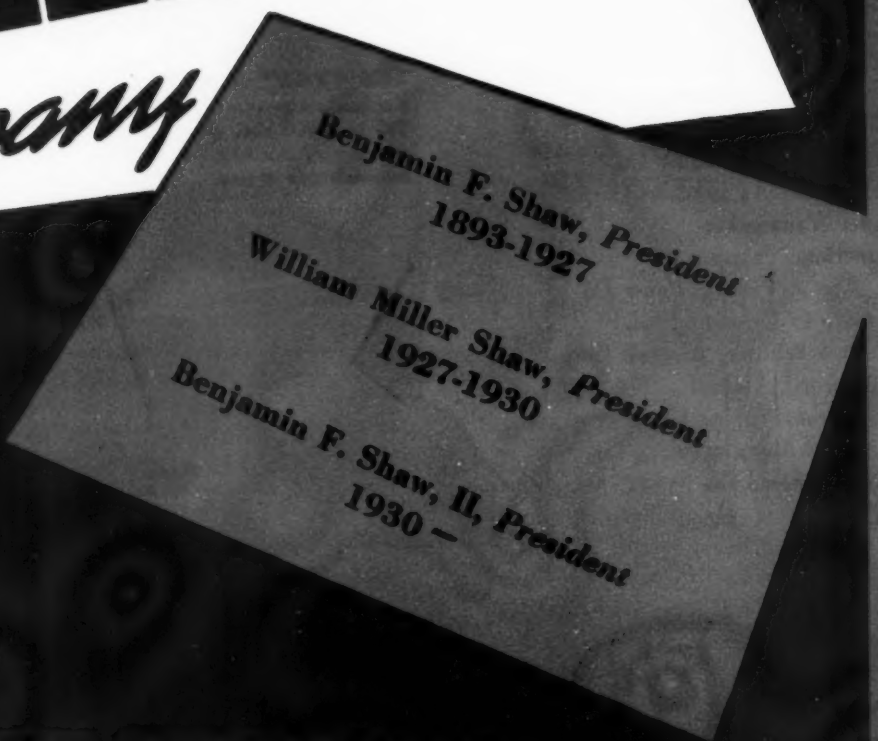


Every stoker installation is an individual problem. That is why "F&E" stokers have been designed for versatility. Three basic models shown above serve as backgrounds. Series 70 is furnished with single or double retort, electro-hydraulic or steam drive, stationary or moving grates ...according to the requirements of your particular firing job.

# F&E UNDERFEED STOKERS

FIFTIETH ANNIVERSARY YEAR

# Benjamin F. SHAW Company




## PIPING FABRICATORS

## CONTRACTORS & DISTRIBUTORS

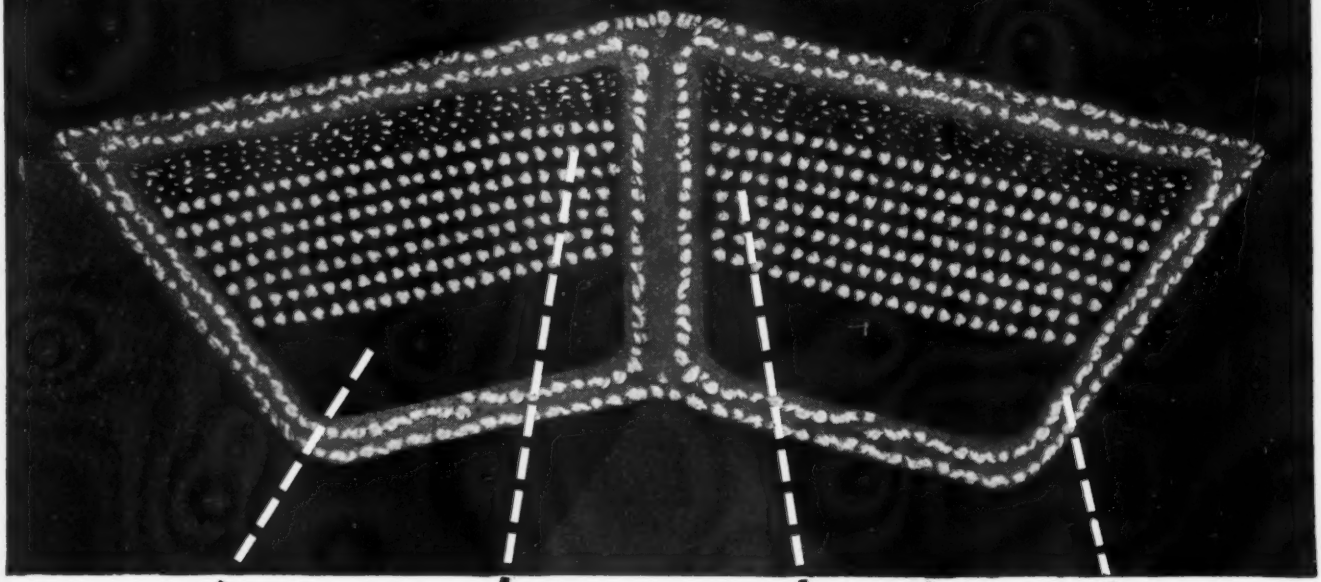
SECOND AND LOMBARD STREETS

WILMINGTON • DELAWARE

# Open Book on WARTIME CARE OF V-Belts

Texrope Super-7's new Design-Against-Wear points to ways you can make V-belts last longer — whatever brand you use — saving equipment vital to victory!

*V-Day needs every V-Belt*



**DESIGN VS. HEAT . . .** Texrope Super-7's revolutionary new shock-absorbing rubber cushion contributes to cool operation.

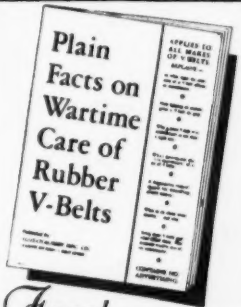
**YOU** can fight friction and heat by preventing misalignment. When present, it subjects V-belts to rubbing on their sides . . . builds up heat. So keep grooves in line — shafts parallel. And send in to Allis-Chalmers for "Plain Facts on Wartime Care of Rubber V-belts"; see p. 9.

**DESIGN VS. STRETCH** Texrope Super-7's 50% stronger cords produced by the new Flexon process combat stretching — plus the slip and heating that might result.

**YOU** can fight stretch — no matter what make of V-belts you are using — by promptly taking up any extra slack that may develop. Inspect drives regularly. See pp. 6 & 7 of Allis-Chalmers' new V-belt maintenance book for tips on proper tension.

**DESIGN VS. BREAKS** The 20% more cords built into the new Texrope Super-7 combat strains.

**YOU** can fight breaks by requiring that your V-belts never be pried into grooves — nor rolled from one groove to the next. Before installing or removing V-belts, the motor always should be moved forward. For added data, see POST MORTEMS, starting on p. 12 of "Plain Facts on Wartime Care of Rubber V-belts."




*Free!* Every engineer should have this important new handbook in his technical library. Applies to *all* makes —contains no advertising.

☞ *When you do need new V-belts, invest in the best . . . Texrope Super-7!*

A 1542-A

# ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

## TEXROPE* SUPER-7 V-BELTS

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes.....½ h.p. to 2,000 h.p.

# Sturtevant Systems

REG. U. S PAT. OFF.

## AND EQUIPMENT

ENGINEERED FOR PRECISION-VENTILATING, HEATING, AIR CONDITIONING, DRYING, DUST AND FUME CONTROL, PNEUMATIC CONVEYING, MECHANICAL DRAFT

# Bad Breath get by...in 194V?

**IT IS NO IDLE DREAM that after this war every plant must pay more attention to indoor air. In the miracles that America's industrial production is performing lies a lesson for any far-seeing business executive.**

Think of the countless new plants that have been completely air conditioned. Whether for 'plane engines or range finders, gas tanks or uniforms, Sturtevant Equipment has gone in, not for employees' comfort alone, but to turn out war goods faster, cheaper, more efficiently.

**In aircraft engine factories,** for example, plant weather is *ideal* for production, *consistent* for machining parts that must be the same as yesterday's and tomorrow's. As a result, absenteeism as well as scrapage is held to a minimum. In the manufacture of ultra-precision range finders, air conditioning makes possible assembly and test adjustments within tolerances never realized before—*a millionth of an inch.*

**In weaving wool fibres** into uniforms, air conditioning eliminates troublesome static sparks... maintains quality and weight that meet strict Government "specs". In making self-sealing gas tanks, air conditioning is on the job to carry off toxic solvents and eliminate the static sparks that might explode them.

**And a thousand more products,** each with a special reason why Sturtevant Air Conditioning went to work. Remember all of this modern plant space will still be in the picture after the war. And any manufacturer who is going to compete without *controlled indoor air* will be at a decided disadvantage.

**ENGINEERED AIR will make a difference...**

Yes, in our post-war world, air will make the difference between profit and loss in many a plant—controlled air, engineered to serve efficiently—in all phases of industrial air conditioning, heating, ventilating, drying, dust and fume control, pneumatic conveying, and mechanical draft. And with new war-won knowledge, backed by experience as the pioneer in air-handling, Sturtevant will make available to you *engineered systems and equipment* that "Put Air to Work" with utmost efficiency and economy.

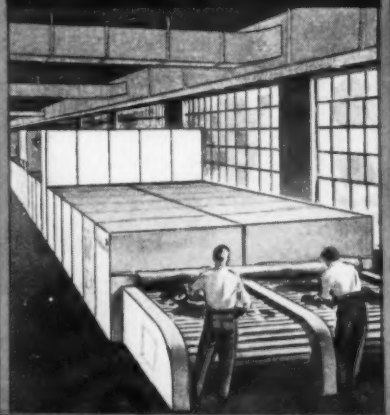
B. F. STURTEVANT COMPANY
*Hyde Park, Boston, Mass.* *Branches in 40 Cities*
B. F. Sturtevant Company of Canada, Ltd., Galt, Toronto, Montreal

**STURTEVANT—FOUNDER OF THE AIR HANDLING INDUSTRY**

Sturtevant
REG. U.S. PAT. OFF.
*Puts Air to Work*

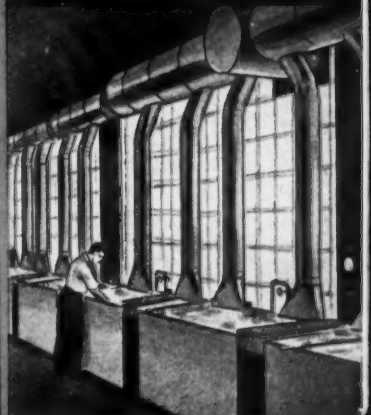
AIR CONDITIONING

DRYING AND HEATING

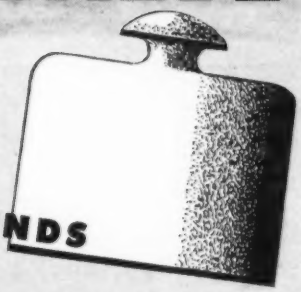


VENTILATING

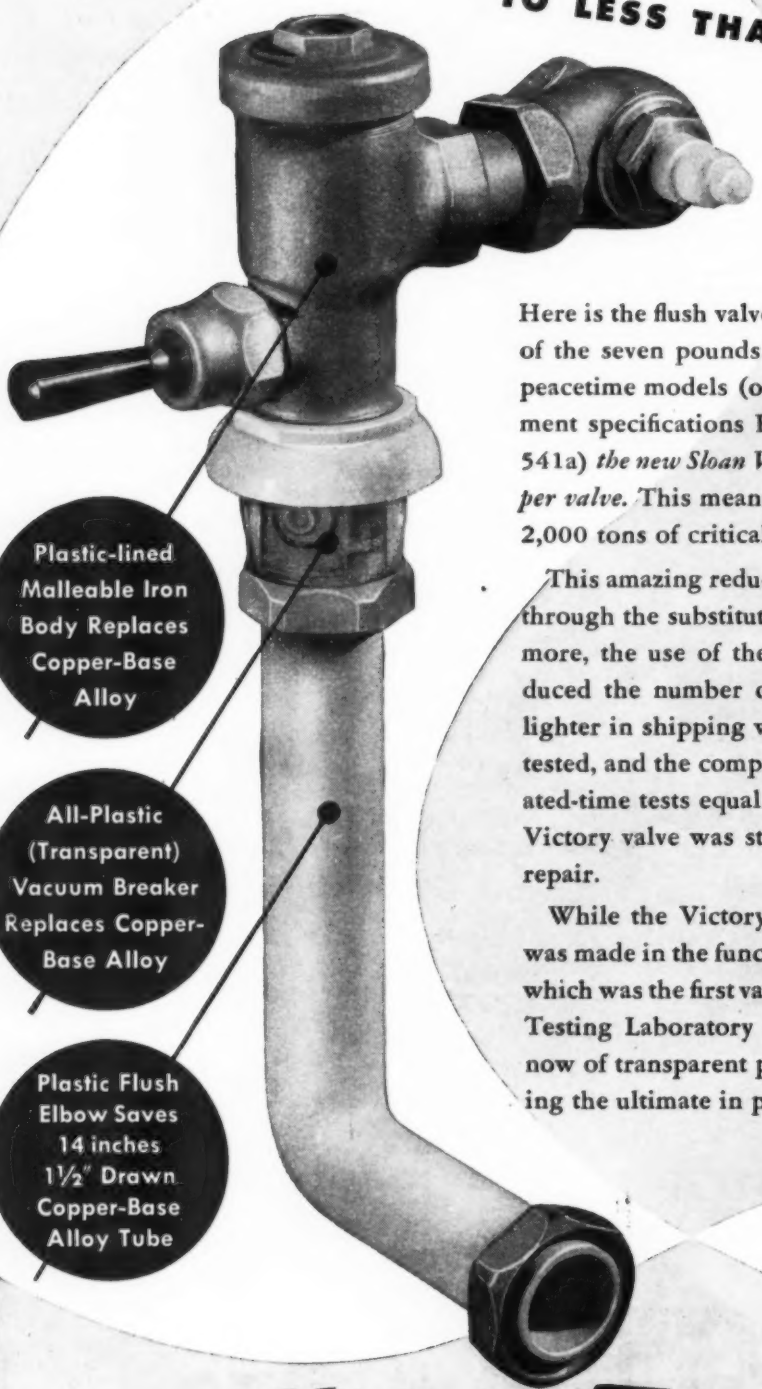
DUST AND FUME CONTROL



# THE SLOAN *VICTORY* VALVE



## REDUCES COPPER CONTENT FROM SIX POUNDS TO LESS THAN FOUR OUNCES—


Plastic-lined Malleable Iron Body Replaces Copper-Base Alloy
All-Plastic (Transparent) Vacuum Breaker Replaces Copper-Base Alloy
Plastic Flush Elbow Saves 14 inches 1½" Drawn Copper-Base Alloy Tube

Here is the flush valve that *really* saves critical materials. Instead of the seven pounds of copper-base alloy formerly used in the peacetime models (or the 2¼ pounds permitted by War Department specifications PE-623 and Federal Specification E-WW-P-541a) *the new Sloan Victory valve uses less than four ounces of copper per valve.* This means that Sloan alone is saving the nation over 2,000 tons of critical copper per year.

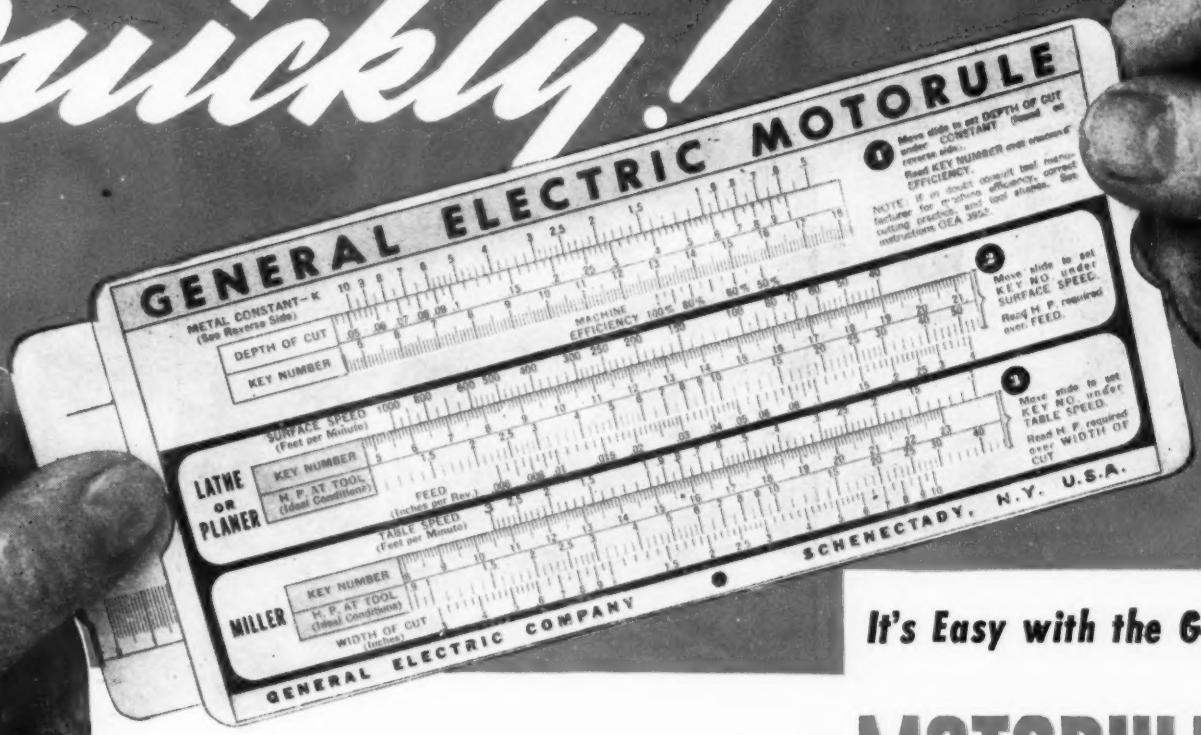
This amazing reduction in critical materials was brought about through the substitution of plastics and malleable iron. Furthermore, the use of these substitute materials has appreciably reduced the number of parts, and the new valve is 2½ pounds lighter in shipping weight. All parts have been thoroughly field tested, and the complete valve has undergone laboratory accelerated-time tests equal to 10 years normal service, after which the Victory valve was still working perfectly and without need for repair.

While the Victory Vacuum Breaker is all-plastic, no change was made in the functional design of the original Sloan V-100-A, which was the first vacuum breaker to be approved by the N.A.M.P. Testing Laboratory at the University of Iowa. Its outer-shell, now of transparent plastic, permits *visual* inspection, thus assuring the ultimate in protection against back-syphonage.

**SLOAN VALVE COMPANY**
4300 West Lake Street
CHICAGO

## SLOAN *VICTORY TYPE* FLUSH VALVES

# FIND METAL-CUTTING HORSEPOWER Quickly!




## It's Easy with the G-E MOTORULE*

***This newly developed load calculator*** makes it easy to figure the motor horsepower required for metal-cutting operations when the recommendations of the machine builder are unavailable. Its advantages? You can avoid *undermotoring* and save yourself production delays; you can avoid *overmotoring* and save the nation vitally needed steel, copper, and aluminum.

***The G-E MOTORULE is accurate*** for a wide variety of cutting operations on lathes, drills, milling machines, and planers. It works on a wide range of materials, because you start from a convenient table of constants for the material being cut.

***The results of many years of work*** by metal-cutting authorities were used by G-E engineers as a basis for the MOTORULE. The formulas were checked against actual load tests, and leading machine-tool builders were consulted.

***The MOTORULE will help you*** in making sure of adequate motor capacity on machines being put to new war work, and in selecting motors for machines formerly driven from line shafting. To get your MOTORULE, just get in touch with your G-E Motor Representative. Or, if you wish, mail the coupon direct to General Electric, Schenectady, N. Y.

First you refer to a convenient table of constants, printed on each rule, choosing the constant for the particular type of metal to be cut. Then by setting the scales to the known cutting speed, feed, and cut, you arrive at the cutting power required on the basis of ideal tool and machine conditions. Complete instructions are furnished with each MOTORULE.

*The MOTORULE is not intended to supplant the instructions of machine builders as to the power requirements of their machines. It is offered to fill the gap when these recommendations are unavailable.

**SPECIFY TRI-CLAD MOTORS**

**Standard G-E Motors Are Generally Available without Delay for War Jobs**

General Electric Co., Sec. EE750-159
Schenectady, N. Y.

☐ Please send your MOTOR FITNESS MANUAL, GED-1017.

☐ Please send me a G-E MOTORULE, with full instructions and leaflet giving the principles on which it is based.

Name .....

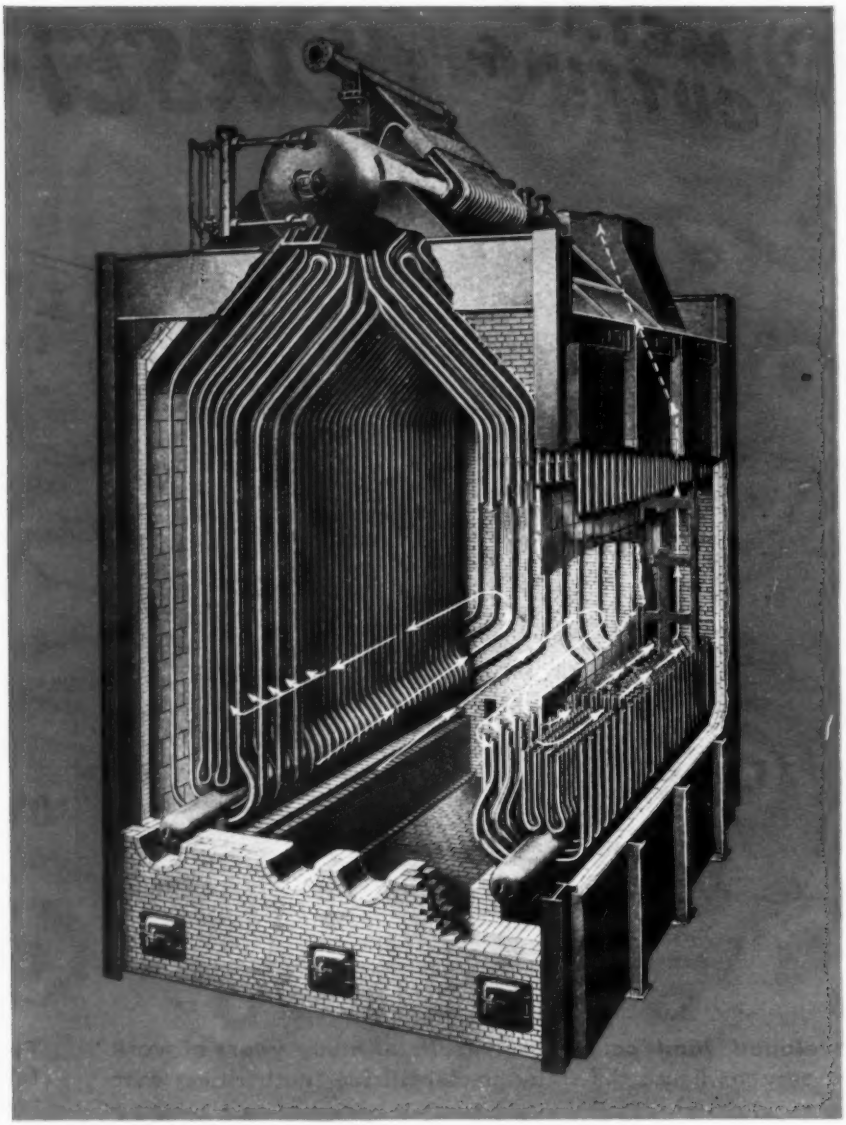
Company .....

Street .....

City ..... State .....

8030

**GENERAL ELECTRIC**



# STEAM . . . TO KEEP 'EM RUNNING!

Steam is the energy component in the production of many war essentials—from jeeps to battleships, from munitions to bomber fuel.

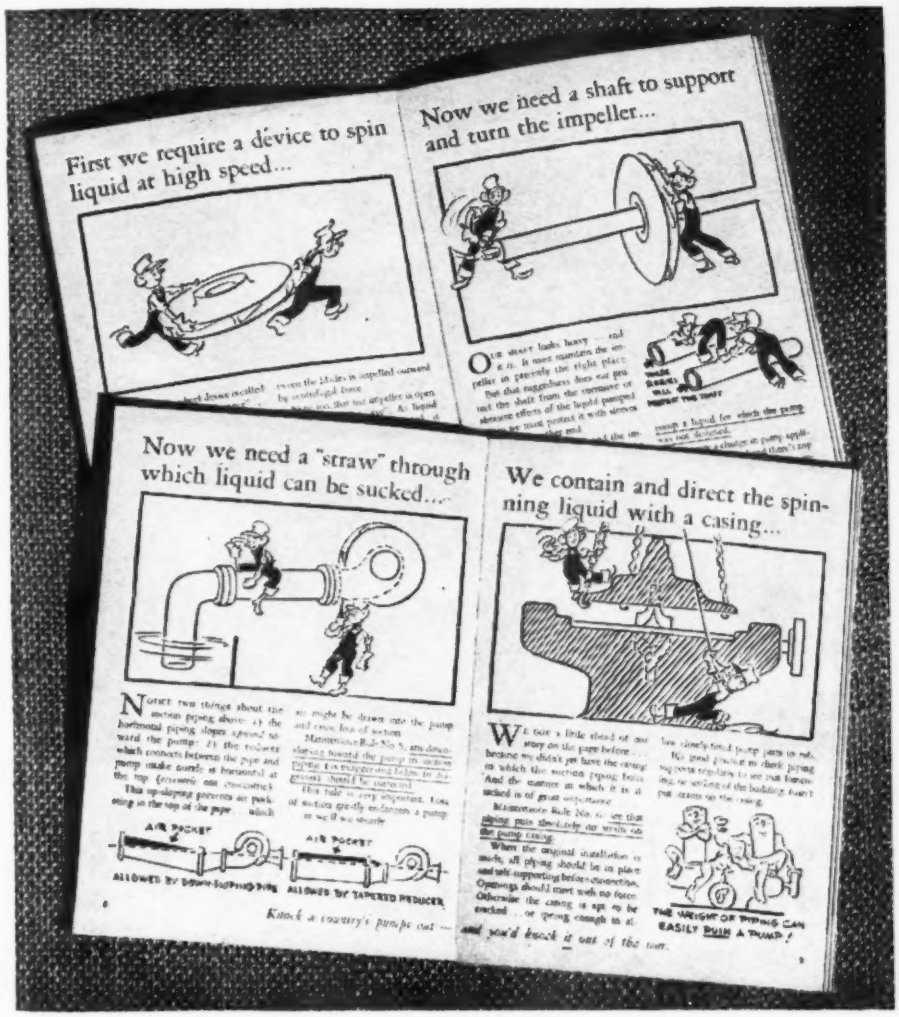
The "S-A" boiler with its single, welded drum—provides high steam capacity from minimum critical material and is admirably suited for industrial power in peace or war. High overload capacity, reliability, and ease of maintenance are important for war output. Efficiency, compactness and accessibility are factors for peace time operation.

Fifty of these versatile and effective units are now under construction for critical war use—decisive proof of satisfactory performance.

**FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK, N. Y.**

**FOSTER WHEELER**

# Man the Pumps!


First we require a device to spin liquid at high speed...
Now we need a shaft to support and turn the impeller...
Now we need a "straw" through which liquid can be sucked....
We contain and direct the spinning liquid with a casing...
AIR POCKET
AIR POCKET
ALLOWED BY TAPERED PRODUCER
Knock a country's pumps out —
THE WEIGHT OF PIPING CAN EASILY RUIN A PUMP!

***When you do need new pumps***—take a good look at the extra efficiency, ruggedness and long life built into Allis-Chalmers centrifugal pumps . . . the famous "Electrifugal" — and all types of pumps for every purpose. In the meantime, let "Handbook for Wartime Care of Centrifugal Pumps" help you make present pumps *last!*→

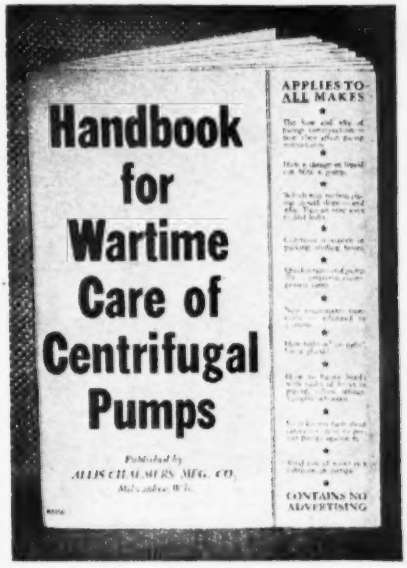
**ALLIS-CHALMERS**
**MILWAUKEE**

AC — WE WORK FOR VICTORY — WE PLAN FOR PEACE

## —TODAY THAT MEANS: "MAKE 'EM LAST!" . . AND HERE'S ALLIS-CHALMERS' GREAT NEW CENTRIFUGAL PUMP MAINTENANCE GUIDE TO HELP YOU DO IT!

HERE'S THE REASON most pre-war pump maintenance literature is seriously out of date today: *pumps that used to work 1800 hours a year are now working 8700 hours a year.*

Another reason: America can no longer *afford* unnecessary pump failures or lowered efficiency!




In Allis-Chalmers' new centrifugal pump maintenance book a pump is *built* . . . giving fresh, new insight into the kind of care a pump needs in *wartime.*

Tear out the order form below and send in today for *your* free copy!

ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive *free of charge* a copy of your "Handbook for Wartime Care of Centrifugal Pumps".

(Name)

(Title)

(Company)

(Street Address)

(City and State)

A-1576-3

# "if you'll pass it on to us!"

So say the Marines . . . and our fighting men everywhere. They'll pass on the ammunition, if we'll pass it to them.

Maintain capacity war production at top-speed efficiency. Use the best quality packings, gaskets and oil seals—they give the longest service and help you avoid frequent shut-downs.

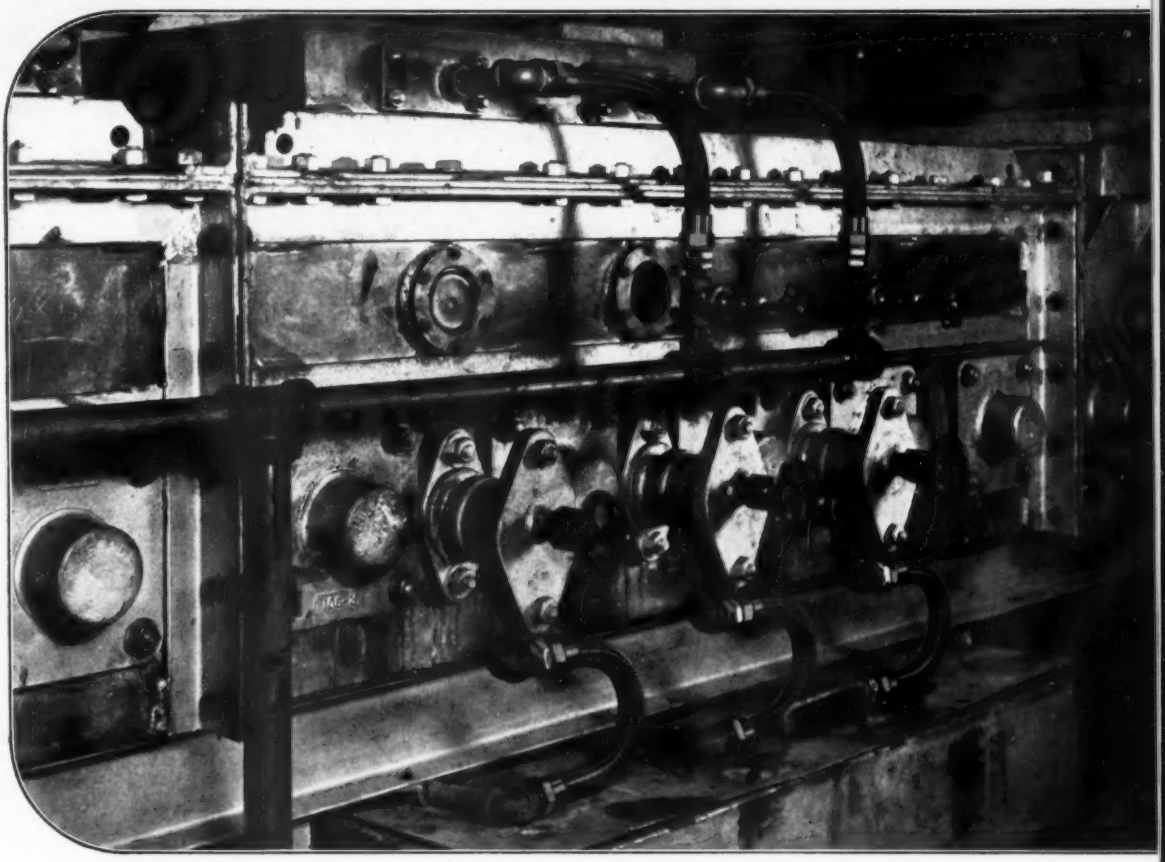
Garlock

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

*Manufacturers of GARLOCK Packings, Gaskets and KLOZURE Oil Seals*

In Canada: The Garlock Packing Company of Canada Limited, Montreal, Que.

**METAL makes the ONE irreplaceable flexible tubing**



Annealing of shell cases in this furnace is a critical and exacting operation which must not be interrupted by faulty feed lines. The use of American "Seamless" Flexible Bronze Tubing insures tight, free-flowing water connections.

# Products of American Metal Hose adaptable to every industrial need

Many materials can be endowed with flexibility . . . and several of them may be fashioned into flexible tubing.

But only one . . . METAL . . . can stand up under the temperatures, pressures, and exposures to which such conveyors are subjected in their varied industrial duties.

American Flexible Metal Hose and Tubing, in a variety of styles and metals, not only conveys gas, oil, steam, water, solvents and chips but in addition serves to isolate vibration, connect misaligned parts and sheath vitally important instrument wiring. Their uses in manufacture, product design and maintenance are too widespread to detail but it is safe to say that a large percentage of war plant machinery, the products of these plants and the equipment which transports them, could hardly function without flexible metal tubing . . . now supplied by "American" to the limit of its ability.

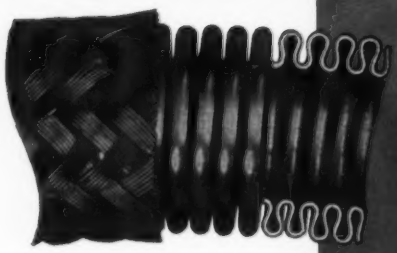
When freed for postwar utility, American Flexible Metal Hose and Tubing . . . and especially "Seamless" . . . will contribute mightily to the greater efficiency of machinery, improved operation of planes, motor vehicles, trains, ships, internal combustion engines, communication and air conditioning systems, agricultural equipment and a thousand and one products of peacetime design.

If it's a question of strength, flexibility and long life under severe operation, specify *metal* . . . American Flexible *Metal* Hose and Tubing.

**FLEXIBILITY of garden hose**
**DEPENDABILITY of metal**
**STRENGTH of rigid pipe**

**For product information, please turn**

# American Seamless



**American Seamless.** For applications where 100% tightness is essential. Made from *seamless* metal tubes — no packing, joints, welds or laps — the best "insurance" against leakage. Ideal for conveying air, oil, steam, water, volatile liquids and gases. Wire braid "jackets" reinforce tubing for high pressure services. Available in any workable metal.

The American Seamless fuel (gas) line on this heat treating furnace assures absolute safety and because it is flexible, allows the burner to be tilted freely.

# American Interlocked

**American Interlocked.** Strip metal, wound into "full-interlock", packed with asbestos, forms the toughest flexible hose for all-round service . . . the strength and last-ability of metal plus extreme flexibility for ease in handling. Made in bronze for steam and water — galvanized steel for oils . . . also in other workable metals.

American Interlocked Flexible Steel Oil Hose is shown here unloading tank cars. It is also used for cargo loading and discharge purposes.

# American Type U.I.

**American Type U.I.** Full interlocked, but unpacked . . . a lightweight flexible metal hose for carrying hot air, grinder dust, chips or light dry material. Made from brass, galvanized, stainless steel, aluminum, in sizes to 8" I.D.

American Flexible Metal Hose, Type U.I., conveys chemical powder on this Cotton Dusting Machine.

The American Metal Hose products described above are supplemented by other types of hose for various applications and conditions of service. For instance, Type BD 20, a ball-bearing type of interlocked hose, jacketed with wire braid — a rugged hose in steel or bronze up to 1-¼" I.D. for conveying steam, oils, greases, etc. Whether you need a flexible connector for misaligned or moving parts, for isolating vibration, for conveying air, water, oil, steam or fuel, you'll likely find we have a type of flexible metal hose or tubing that will do the job more capably. Complete descriptive literature available on request.

43185

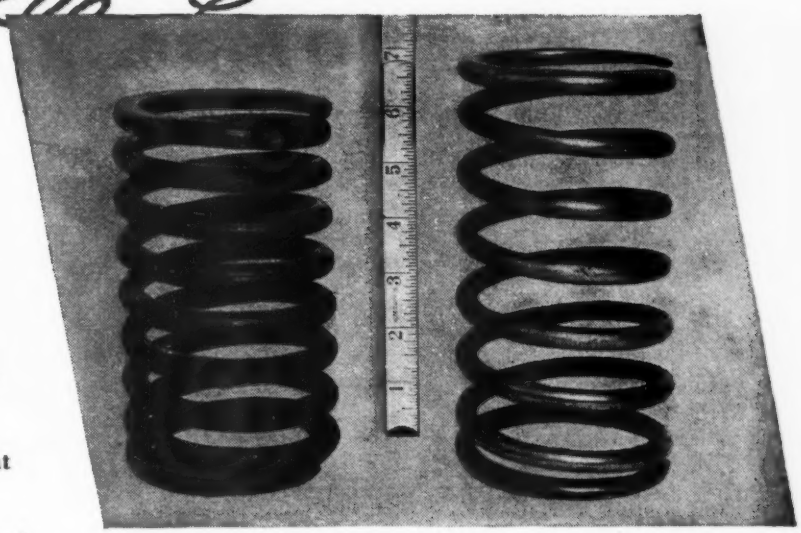
# American Metal Hose

ANACONDA
from mine to consumer

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY
*General Offices: Waterbury, Conn. . . . Subsidiary of Anaconda Copper Mining Company*
*In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

## After heat and corrosion have launched their attack—

# THERE'S STILL PLENTY OF SPRING IN THESE 4 NICKEL ALLOYS



When heat, alternating stresses, rust and corrosion go on the offensive, springs of ordinary metals withdraw, listless, lifeless.

However, four high-nickel alloys, Monel, "K" Monel, "Z" Nickel and Inconel, stand up admirably in this severe service.

All can be used in helical, spiral and flat springs of every shape and size.

They have high endurance limit . . . good strength . . . unusual stiffness. All are immune to rust and stubbornly resist most common corrosives.

But the individual characteristics of these nickel alloys vary to such an extent that each is equipped to do certain types of jobs best. Following is a brief story on each:

*Finding a suitable valve spring to withstand superheated steam at 750° F. was a real problem. Regular carbon springs were practically useless. Various other alloys lasted only 3 to 4 weeks. Finally springs made of heat-resisting Inconel were installed. After 5 years' service, all Inconel springs are still in constant use.*

**MONEL**—67% nickel, 30% copper—Lowest in cost, Monel is widely used for rustproof, corrosion-resisting springs that are moderately stressed. It is slightly magnetic and may be used at temperatures up to 500° F.

**"K" MONEL**—66% nickel, 29% copper, 2¾% aluminum—A non-magnetic alloy with high spring properties and excellent corrosion resistance. "K" Monel is heat-treatable, and may be used at temperatures up to 500° F in springs under fairly high stresses.

**"Z" NICKEL**—98% nickel—A heat-treatable alloy with excellent spring properties plus the corrosion resistance of Pure nickel. "Z" Nickel has good electrical conductivity and is moderately magnetic. Temperatures up to 400° F have little effect on its spring properties.

**INCONEL**—80% nickel, 13% chromium—A heat-resisting alloy for springs operating at temperatures up to 700° F. Inconel is resistant to corrosion by a wide variety of chemicals.

• • •

For further information please send for a copy of "New Spring Alloys for Tough Jobs." Please address: The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

★ ★ **INCO NICKEL ALLOYS** ★ ★

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • NICKEL • "Z" NICKEL

*Sheet...Strip...Rod...Tubing...Wire...Castings*

# Timely change from oil to coal made possible by recent Taylor Stoker Installation

BECAUSE of the adaptability of A-E-CO Taylor Stokers to changing conditions, an important power plant will soon reduce the national consumption of oil by 10,000,000 gallons a year.

The boiler and firing equipment for this plant were purchased in 1941 to burn oil—but the furnace design was predicated on a partial or entire conversion to coal should conditions make such a conversion desirable.

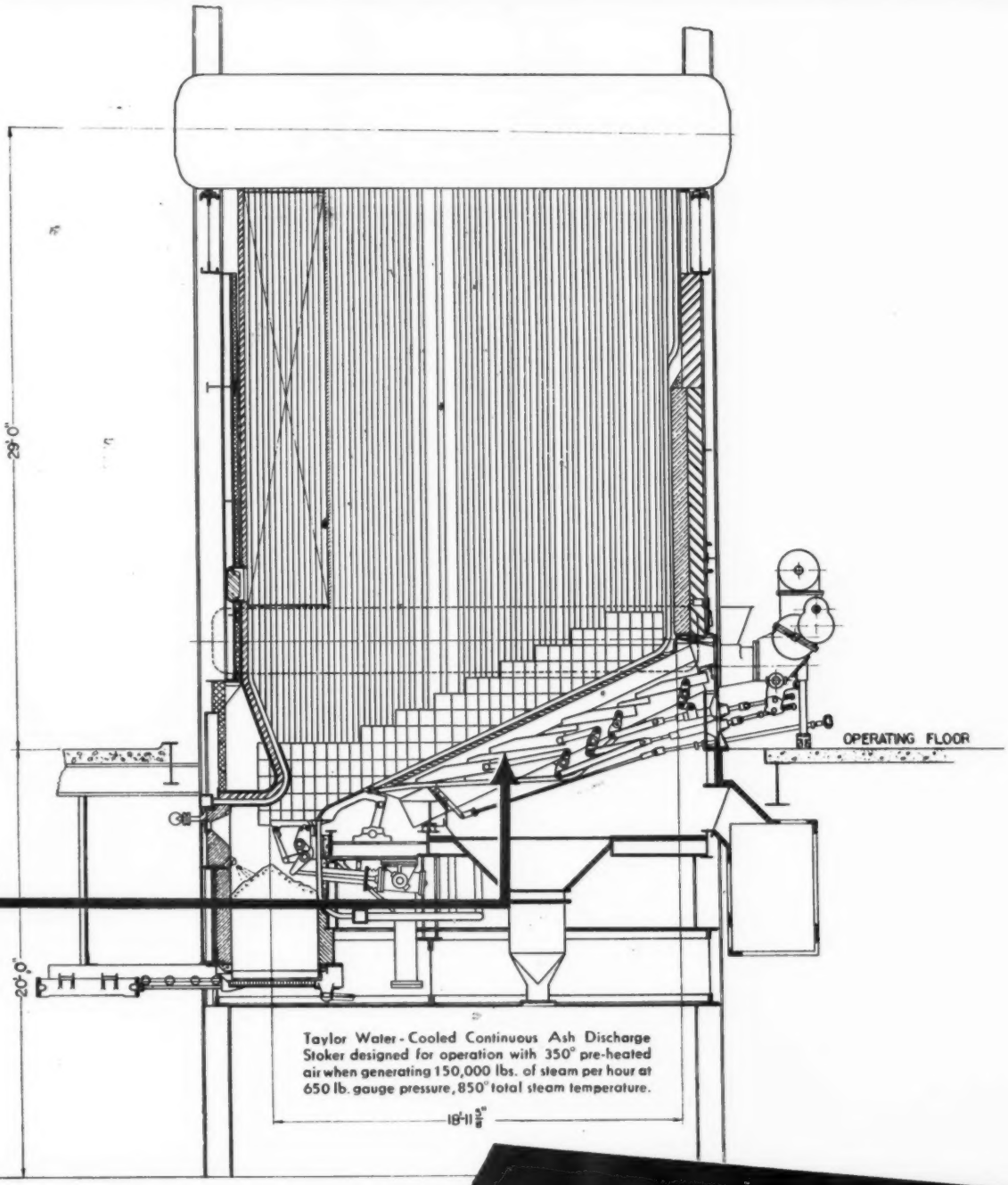
Because of the foresight on the part of the management of this plant, the oil shortage will not disrupt their production. The Taylor Stoker being installed will meet the emergency conditions imposed by war as it will the economic conditions of the peace to follow.

**JUDGE THE SELECTION OF FUEL FIRING EQUIPMENT BY THESE TWELVE POINTS**

1. **RELIABILITY**—the ability to operate with minimum outage and minimum standby equipment.
2. **CAPACITY**—the ability to provide adequate prime capacity ratings, with sufficient reserve capacity for emergencies.
3. **MAINTENANCE**—the ability to operate continuously with minimum repair costs.
4. **FLEXIBILITY**—the ability to follow the steam demand upward or downward . . . quickly and without sacrificing efficiency.
5. **EFFICIENCY**—the proved **dollar** efficiency (**total** cost of steam production) as shown by actual performance in similar installations.
6. **OPERATION**—the ability to operate continuously, the number and type of operations required, the ease of combustion adjustments, etc.
7. **ADAPTABILITY**—the ability to meet special and limiting conditions, present and future—structural limitations, utilization of present equipment, growth and change of power service demands.
8. **FUEL FLEXIBILITY**—the ability to burn efficiently and easily fuels from many sources having widely varying characteristics.
9. **REFUSE DISPOSAL**—the ability to economically eliminate ash or refuse and the opportunities of disposal at low cost, no cost, or profit.
10. **STACK DISCHARGE**—the practical elimination of "smoke nuisance" without special equipment.
11. **SPACE REQUIREMENTS**—the ability to conform to existing or future space limitations, to short and wide or long and narrow furnaces. Also the accessibility of component parts for maintenance and operation.
12. **OBSOLESCENCE** — the adaptability of the equipment toward possible future modernization with minimum of complication and outage.

**AMERICAN ENGINEERING**

PHILADELPHIA • PENNSYLVANIA


29'-0"
20'-0"
OPERATING FLOOR
Taylor Water-Cooled Continuous Ash Discharge Stoker designed for operation with 350° pre-heated air when generating 150,000 lbs. of steam per hour at 650 lb. gauge pressure, 850° total steam temperature.
18'-11 3/8"

**A-E-CO TAYLOR STOKERS**
**WATER WALLS • ASH HOPPERS**
**HELE-SHAW FLUID POWER**
**MARINE DECK AUXILIARIES**

# A-E-CO TAYLOR STOKER

**G COMPANY**

AE CO 75th ANNIVERSARY

# Helping to Heat
## Cincinnati's B

**Prompt Repair Part Service**

Some of the 12,000 Yarway Blow-Off Valve installations are fifteen, twenty and even twenty-five years old. Today, as always, Yarway Valve users can be assured of prompt shipment of repair parts needed to keep plants running during this emergency.

YARWAY

# t and Power
# 's Beautiful Union Terminal

WHEN the power house serving Cincinnati's Union Terminal was built ten years ago, Yarway Seatless Blow-Off Valves and Yarway Floatless Water Columns and Se-Sure Inclined Gages were selected on the strength of plenty of previous experience with Yarway Equipment. Selected because they had served so well in many plants of the railroads using the Terminal—The Pennsylvania, Louisville and Nashville, Baltimore and Ohio and the Big Four.

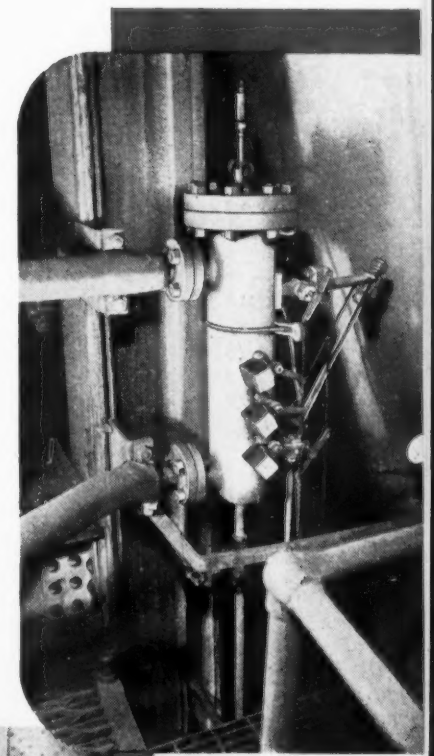
After ten years of fine service involving practically no maintenance, the performance of this Yarway Equipment at Cincinnati has well justified the confidence placed in it.

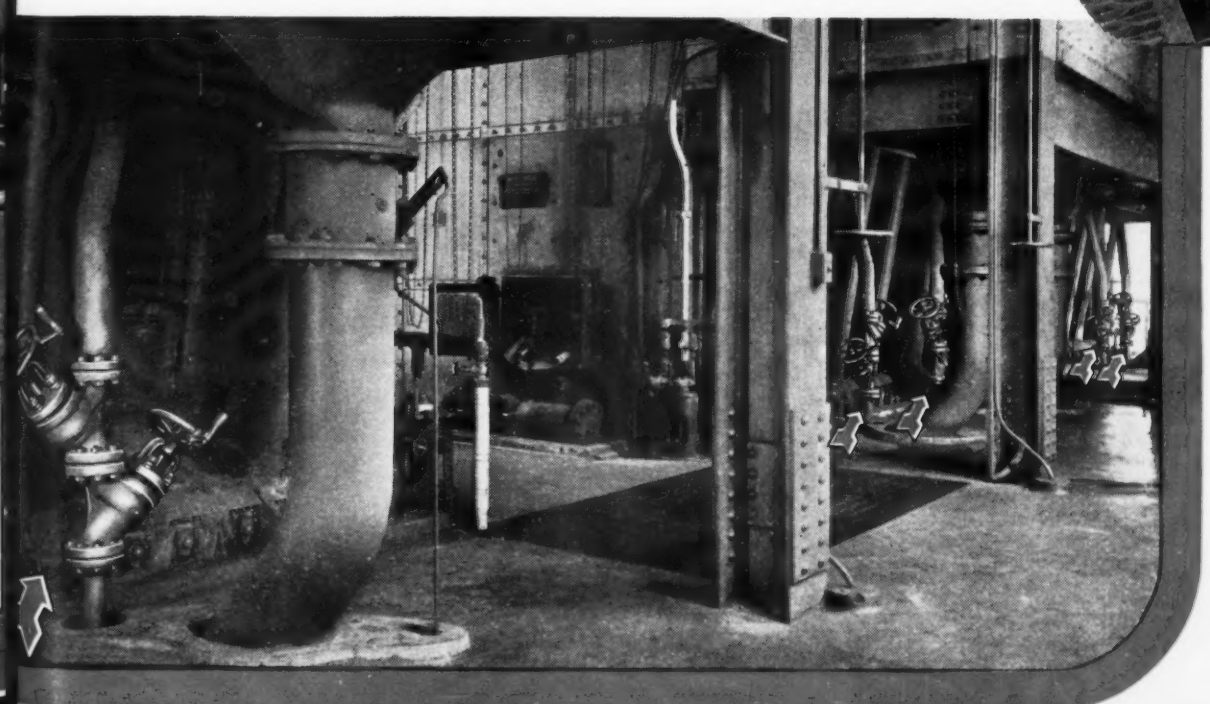
Railroads require dependability above all else in the equipment upon which they rely to provide the most dependable transportation service in the world.

Isn't this the type of year-in and year-out positive protection you want for your boiler investment; the *trouble-free—maintenance-free* service that reduces operating costs?

Write for Blow-Off Valve Catalog. Section B-422 for pressures up to 400 lbs; section B-431 for higher pressures. Water Column and Gage Catalog WG-1809.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia

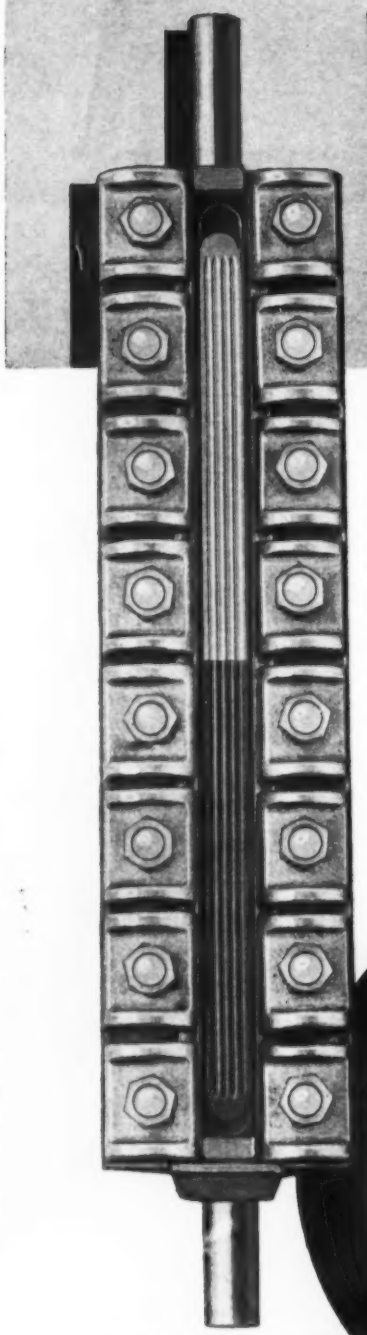




(*Above*) One of the three Yarway Hi-Lo Alarm Water Columns and Se-Sure Inclined Gages used on the three boilers at Cincinnati Union Terminal.

(*At left*) Six sets of 2½". Fig. No. 3488-3488 Yarway Seatless Tandem Valves are in use at the power plant of the Cincinnati Union Terminal—three sets on boiler blowdown lines and three sets on water wall drains.

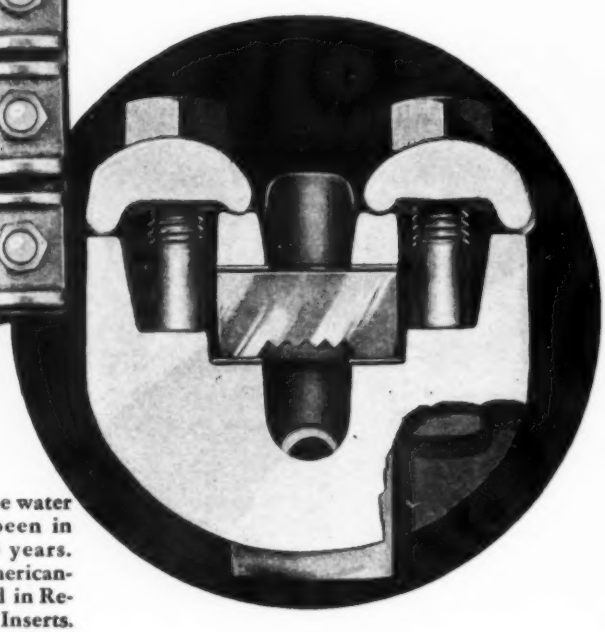
# BLOW-OFF VALVES



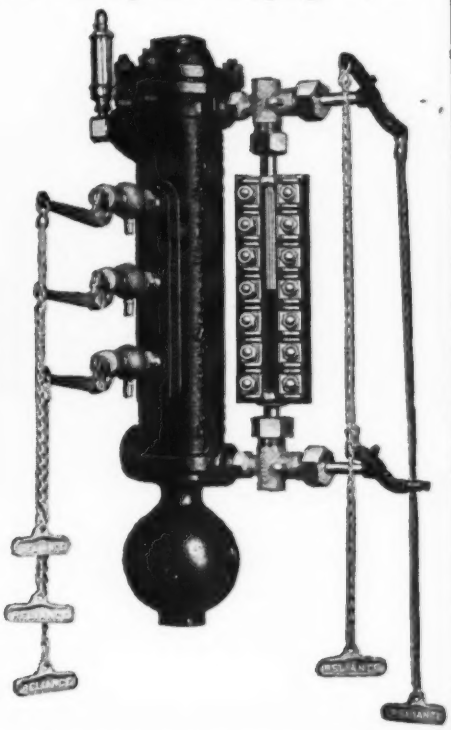
*Another way You can help prevent accidents in your Power Plant —*

## Meet the vital need for reading water levels quickly, accurately, safely

There's no sharper picture you can get of your water level than the black-white contrast visible in PRISMATIC Water Gage. Water shows *black* to the reader — steam shows *white.* Here is readability that is mistake-proof! Anyone can read it — and anyone can service it. PRISMATIC is composed of safe shatter-proof glass (a thick plate of it, with longitudinal prisms cast in one face) appropriately housed in a metal body designed for adequate strength, correct leak-proof clamping of the



The prismatic type water gage insert has been in use for over 50 years. High quality American-made glass is used in Reliance PRISMATIC Inserts.

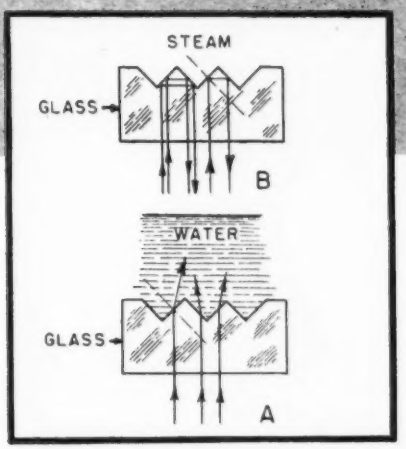


Since 1884

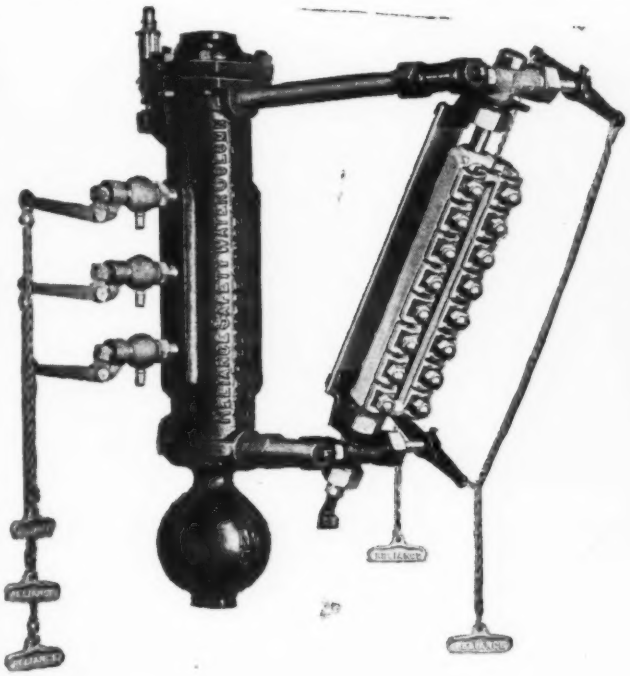
# Reliance

# . . . clear-cut, instant water gage reading with Reliance PRISMATIC Water Gage Inserts

glass, and easy accessibility for cleaning when necessary. • PRISMATIC has an important place on tanks and other vessels besides your boilers. These gages are often in out-of-the-way places where the hazard of tubular glass breakage is greater because of low visibility. This emphasizes the desirability of PRISMATIC safety. The several sizes of PRISMATICS fill any gage length need; available in single or multiple units. • Your gages deserve something better than tubular glass windows. Write for complete PRISMATIC Gage Glass data contained in the new Bulletin 434.



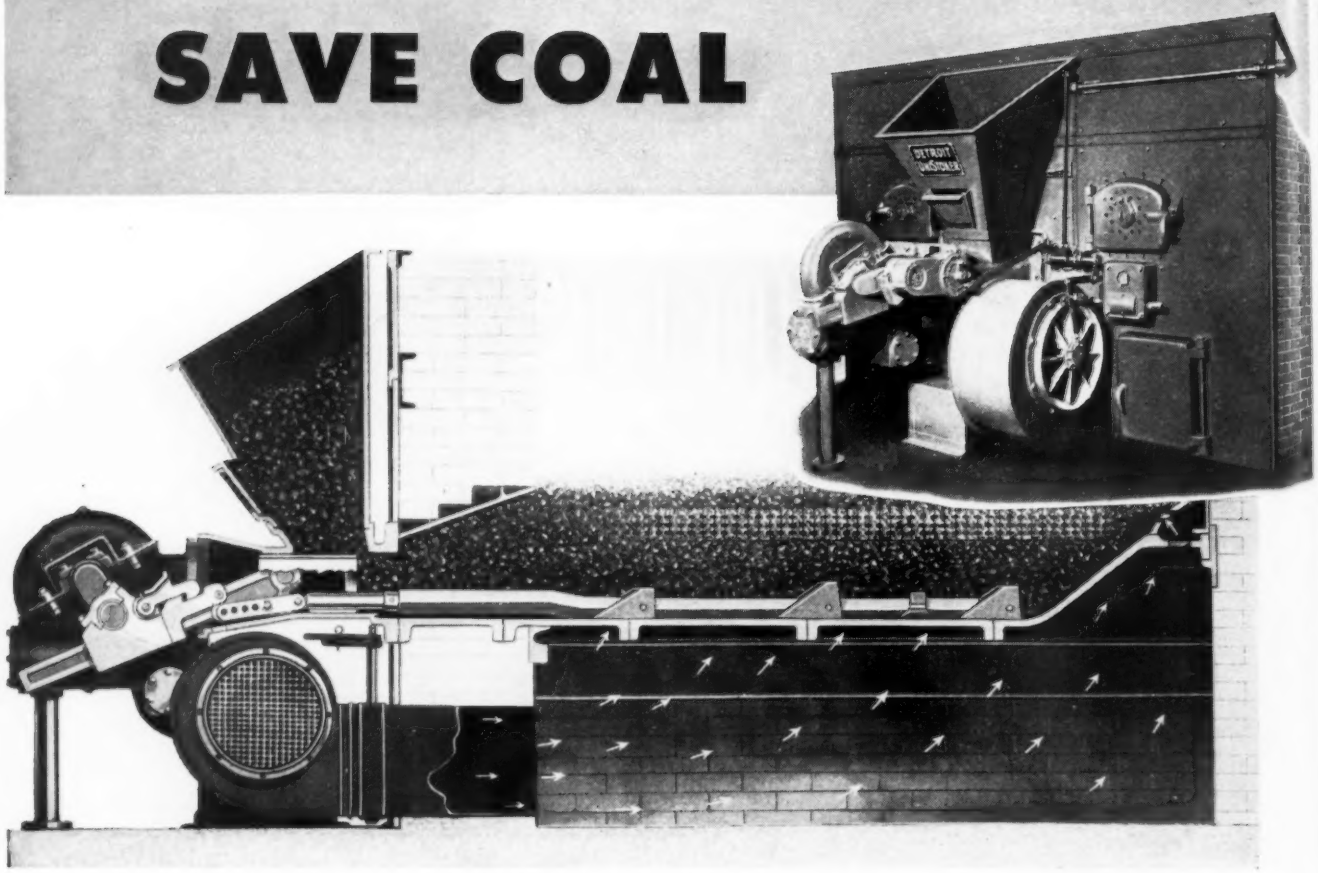

The technical explanation of the prismatic principle in water gages (relating to above diagrams) is given in Bulletin 434.



# BOILER SAFETY DEVICES

THE RELIANCE GAUGE COLUMN CO.
Cleveland, Ohio

# SAVE COAL



## Detroit UniStoker—

for 125 to 250 horsepower boilers. Simple, sturdy design with Detroit Adjustable Feed (coal feed control) provides exceptional flexibility on fluctuating loads.

### READ THESE SAVINGS:

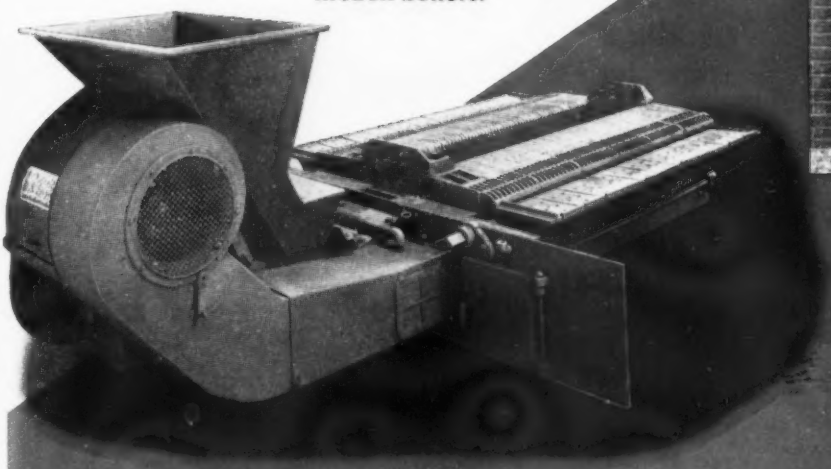
- **A Water Works**—"$3067 saved in 8 months."
- **Dairy Plant**—"Coal cost reduced from 45 to 24 cents per thousand pounds of milk."
- **A Manufacturing Plant**—"Our Detroit UniStoker fired boiler produces more steam with cheaper coal."
- **An Engraving Plant**—"Our Detroit UniStoker is saving annually more than 50% of its total cost."
- **Brewery**—"Saving over previous year in coal consumption has been approximately 35%."
- **Rubber Manufacturing Plant**—"Approximately $5000 a year reduction in fuel and labor costs with four Detroit Stokers."
- **Greenhouse Concern**—"Saved $4160 a year with load increased."
- **Hospital Plant**—"Saved $1367.62 first year and its performance sold us a second UniStoker."

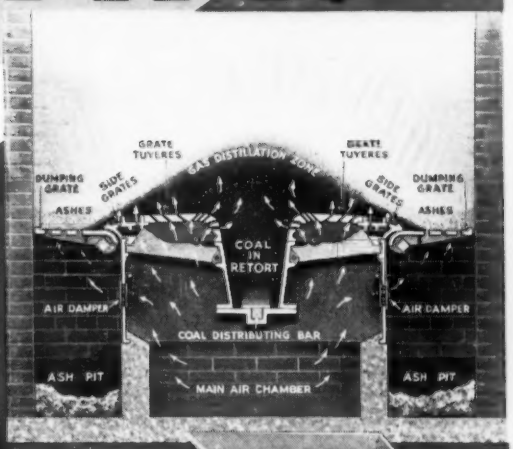
## DETROIT STOKER COMPANY

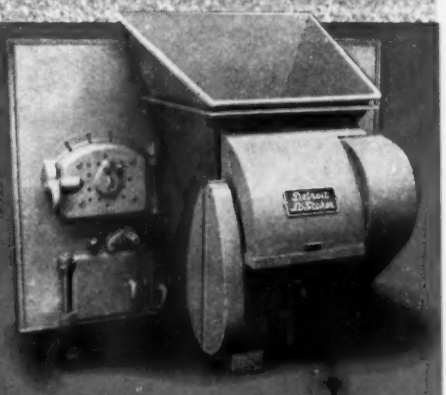
# AND HELP WIN!

## Convert to coal NOW— USE DETROIT STOKERS

Low front to fit the furnace of firebox boilers.





## Detroit LoStoker—

High front for brick-set boilers.

(plunger feed—side cleaning). Applied to firebox, tubular and small water tube boilers of 50 to 150 horsepower. Automatically controlled. A great coal saver.

### READ THESE SAVINGS:

• **A Manufacturing Concern**—"We estimate that the two stokers saved $1837 last year of which $1009 was in fuel and the balance in labor."

• **Laundry Plant**—"In spite of an increase in our business of approximately 15%, a saving of $472 in fuel was effected."

• **A Silk Mill**—"Our fuel oil cost for heating formerly ran about $3000 per year. Our coal cost with your stoker was exactly $1554.09 this year."

• **Chain Store Warehouse and Bakery**—"Stokers have really accomplished more than we contemplated; in fact, our actual check shows 25% saving."

• **Public School Heating Plant**—"Our heating expense with the Detroit LoStoker was just about half the expense with the oil burner formerly installed."

General Motors Bldg. Detroit, Michigan

Works at Monroe, Michigan • Built in Canada at London, Ontario

District Offices in Principal Cities

# "The Greatest Advantage of

**St. Marys Woolen Manufacturing Co.**

PHILIP H. HERZING, President
E. B. TIMMERMEISTER, Vice Pres.
W. J. KIEHLER, Treas.
GLEN J. STEVE, Secy and Sales Mgr.

NEW YORK CITY OFFICE
500 MADISON AVE.
R. C. FRENCH, Mgr.
LOS ANGELES, CALIF. OFFICE
722 S. LOS ANGELES ST.
G. ROELLINGER, Mgr.
CHICAGO, ILL. OFFICE
ROOM 1067 MERCHANDISE MART
W. E. HAWKINS, Mgr.

St. Marys, O.

January 4, 1942

Iron Fireman Manufacturing Co.
Cleveland, Ohio

Gentlemen:

We wish to tell you how pleased we are with our installation of the Iron Fireman Pneumatic Spreader Stoker. We find it ideally suited for our requirements. Formerly we were using several small boilers with over-feed type stokers and were unable to keep our steam pressure to the desired level. The installation of one large boiler and the spreader type stoker has solved our troubles. Since we develop steam for processing purposes only, we do not have elaborate instruments and cannot give you a definite statement as to the increased output of steam, but our conservative opinion is that it is somewhere between seventy and eighty per cent increase.

There is a definite saving in coal costs as we have been able to use considerably cheaper coal as it was necessary to humor our former equipment with a prepared size coal. We have likewise saved considerable tonnage due to better combustion and consuming a far greater amount of the volatile matter. Further, the stoker is a pleasure for our personnel to handle as it has reduced manual effort to the minimum.

However, the greatest advantage is in its extreme flexibility. Our primary use for steam is for processing in four unrelated departments. The demand for steam is very unpredictable. Frequently extreme peaks are imposed upon the boiler with the demand falling off just as rapidly. This is due in part to our dye house, wherein we operate eight dye vats. Each one contains approximately 1,000 gallons of water which must be brought to the boil in a definite period of time according to formula. Since there is no regularity in the demands of a dye house, the boiler equipment must be able to meet the demand peaks when several of the various dye vats are placed on a line simultaneously. As a consequence the stokers must be of a nature to meet these excessive peaks at frequent intervals and be able to decelerate just as rapidly if such a term can be applied to boilers. We find that in spite of the peaks and subsequent falling off that we can hold our steam pressure to within a variance of two pounds. We consider this superb performance.

Yours very truly,
ST. MARYS WOOLEN MFG. CO.

Phil Herzing

Phil. Herzing, President

PH/ar

**IRON FIREMAN**

THE IRON FIREMAN

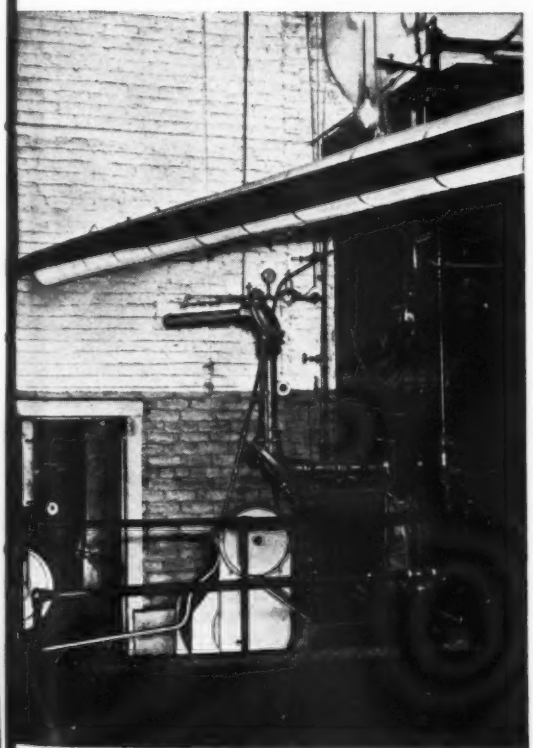
**Automatic Coal Stokers**

# Our IRON FIREMAN Stoker is its Extreme Flexibility"

"Steam pressure is kept at the desired level . . . . . there is a definite saving in coal costs"

*Phil Herzing, Pres.*

PHIL HERZING
*President, St. Marys Woolen Manufacturing Co., manufacturers of the world famous St. Marys blankets.*



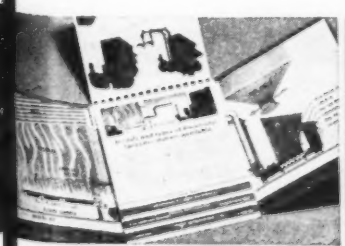
The Iron Fireman Pneumatic Spreader stoker has reduced manual effort to the minimum at St. Mary's Woolen Manufacturing Co.

IT'S performance like this that has won thousands of friends for Iron Fireman. And automatic coal firing, as pioneered and developed by Iron Fireman, has come to the rescue of plants that, due to fuel shortages, must convert from other fuels to coal firing. Stokers are available for firing boilers up to 1000 horsepower and larger.

By government request, Iron Fireman is making more commercial and industrial stokers than ever before. The thousands who will convert to Iron Fireman firing will find these characteristic advantages: (1) Ample reserve for excessive loads; (2) flexibility for sudden steam demands; (3) increased boiler efficiency with clean combustion; (4) uniform pressures or temperatures; (5) smoke and waste reduced to a minimum; (6) fuel savings in dollars and tonnage; (7) ability to burn local coals and help win the battle of production.

If you are faced with fuel changes or increased steam demands, let us tell you how you can buy an Iron Fireman. Write, wire or telephone Iron Fireman Manufacturing Company, Cleveland, Ohio.

Factories in Portland, Oregon; Cleveland, O.; Toronto, Canada.



**FREE BOOK on Pneumatic Spreader Firing**

Contains full descriptions, capacities, operating data, etc., with layouts and photos of 10 actual installations. Sent free, on request. Write to Iron Fireman Mfg. Co., 3502 W. 106th Street, Cleveland, Ohio.

# POUR

**TYCOL**

***SCIENTIFICALLY***

# POINT*

* This is [illegible] of a series of informative [illegible] concerning the [illegible] and significance of commonly used tests and terms employed to describe the characteristics of lubricating oils.

T I D E W A T E R  L U B R I C A N I A

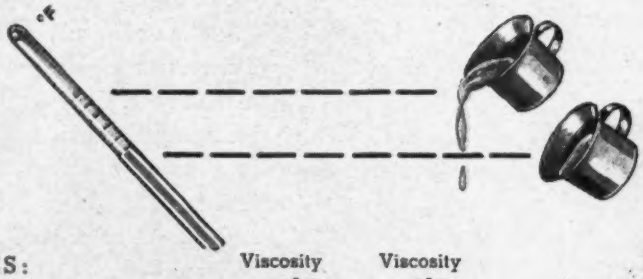
**DEFINITION:** The pour point is the lowest temperature at which the oil will pour or flow when chilled without disturbance under definite prescribed conditions.

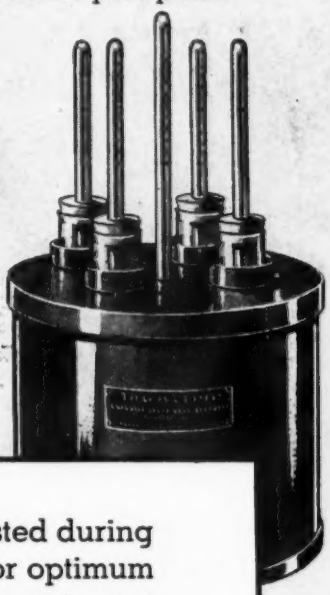
**TEST:** Following a carefully prescribed procedure with standardized equipment, the oil is chilled in a test jar or a corresponding 4 oz. sample bottle. At each oil temperature reading, taken at 5° F. intervals, the test jar is removed and tilted just enough to ascertain whether or not the oil is still fluid.

A temperature point will be reached at which the oil shows no movement when the test jar is held horizontally for exactly 5 seconds. The pour point is the temperature 5° F. above this "non-fluid" point.

**SIGNIFICANCE:** The pour point is an indication of the temperature below which it may not be possible to pour oil from its container, or below which it may not flow in gravity lubrication systems. This may be due either to partial separation of wax crystals forming a spongy network or to congealing of the oil itself.

Therefore the pour point bears no relation to the viscosity of the oil at higher temperatures. Neither does it indicate the pressure flow, or the tendency to "channel" at temperatures below the pour point.





| EXAMPLES: | Viscosity at 210° F. | Viscosity at 32° F. | Pour |
|---|---|---|---|
| Paraffine Base Lubricant.... | 70 | 12,000 | 25° F. |
| Napthenic Base Lubricant.. | 70 | 50,000 | 0° F. |

Tycol lubricants are rigidly controlled and tested during manufacture to the required characteristics for optimum performance. Among many other tests they must meet the pour point requirements of the individual application.

**DRUMS! DRUMS! DRUMS!**
War needs make it extremely important that all empty drums be returned immediately.

## TIDE WATER ASSOCIATED OIL COMPANY

Eastern Division: 17 Battery Place, New York
*Principal Branch Offices:* Boston, Philadelphia, Pittsburgh, Charlotte, N. C.
MAKERS OF THE FAMOUS VEEDOL MOTOR OIL

OIL IS AMMUNITION
USE IT WISELY !

# INDUSTRIAL LUBRICANTS

*ENGINEERED FOR EVERY INDUSTRIAL USE*

# HE READS THE *"Life-lines"* OF GLOBE PRESSURE TUBES

The life expectancy of a Globe Pressure Tube is an open book to the Globe metallurgist. Frequent laboratory tests, including photomicrographic inspection, in addition to careful and thorough individual gauging for wall thickness and outside diameter, insure a consistently uniform quality of product.

Such extra precautions in manufacture may readily be translated into longer life and greater safety in use. This extra margin of safety and strength means lower cost in the long run for the user of Globe Pressure Tubes.

*Globe Engineers are always available to assist in selecting a tube with the exact characteristic you require.*

**GLOBE STEEL TUBES CO., Milwaukee, Wis.**

STAINLESS TUBES
BOILER TUBES
CONDENSER AND HEAT EXCHANGER TUBES
MECHANICAL TUBING

## GLOBE STEEL *Tubes*

GLOBE TUBES

## QUICK FACTS about the NEW GOODYEAR STEEL CABLE V-BELT

**POWER CAPACITY:** Exceeds any V-belt now on the market. Handles overloads and peaks far more satisfactorily.

**STRETCH:** Practically zero -- once matched, always matched.

**SPEED RANGE:** Will stand the higher tensions of lower speeds.

**LIFE:** Less trouble -- in numerous applications has run many times longer.

**ADAPTABILITY:** Makes Multi-V drives usable where heretofore denied by engineering limitations. Permits installation of more compact drives, in many cases without outboard bearings.

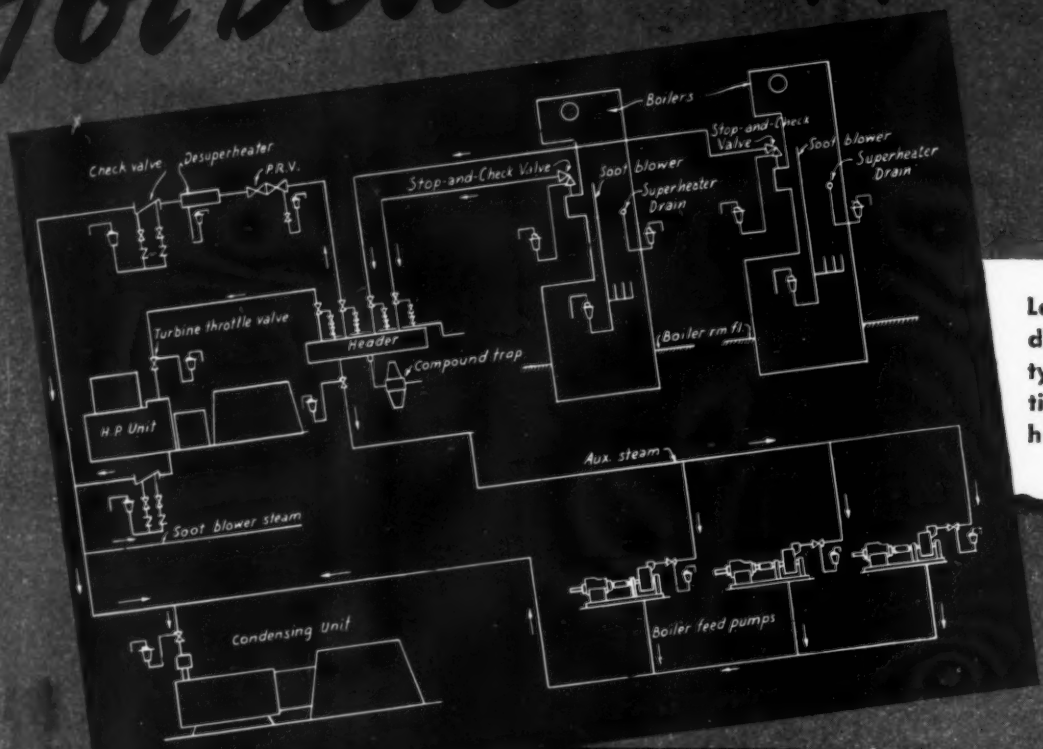
**HEAT RESISTANCE:** Used successfully on U. S. Army tank fan and pump drives where conventional belts "burn out" in a few hours.

**AVAILABILITY:** To war industries having top priority.

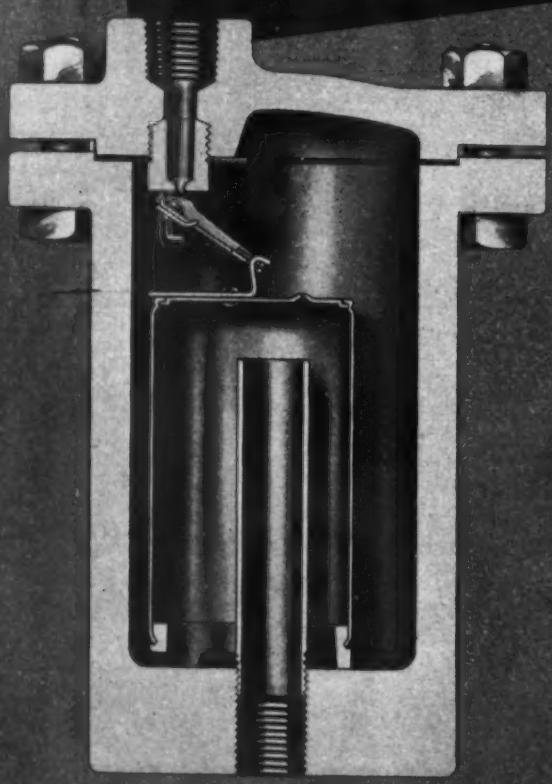
**FOR FULL INFORMATION** and data on this latest Goodyear "first," consult the G.T.M.—Goodyear Technical Man. Or write Goodyear, Akron, Ohio or Los Angeles, California, or contact the nearest Goodyear Industrial Rubber Goods Distributor.

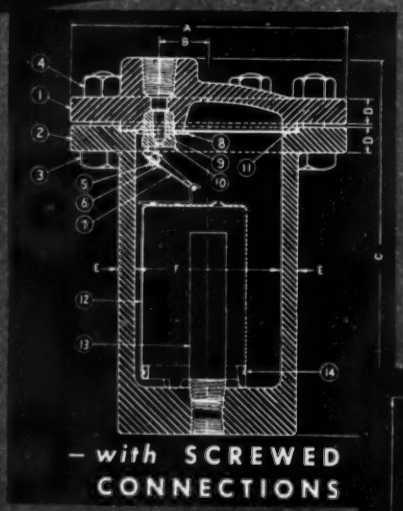
GTM-Specified GOODYEAR ENDLESS STEEL CABLE V-BELT for Multi-V Drives
1. Heavy, super tough black cover with uniform friction, longer life
2. Load-carrying, endless, steel cables in neutral plane
3. Tension and compression sections of high-quality rubber
1
2
3
GOODYEAR
THE GREATEST NAME IN RUBBER

# For Better Trapping

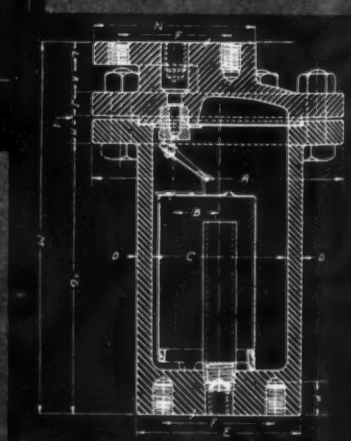



**Left — Schematic diagram showing typical applications of traps to high pressure systems.**



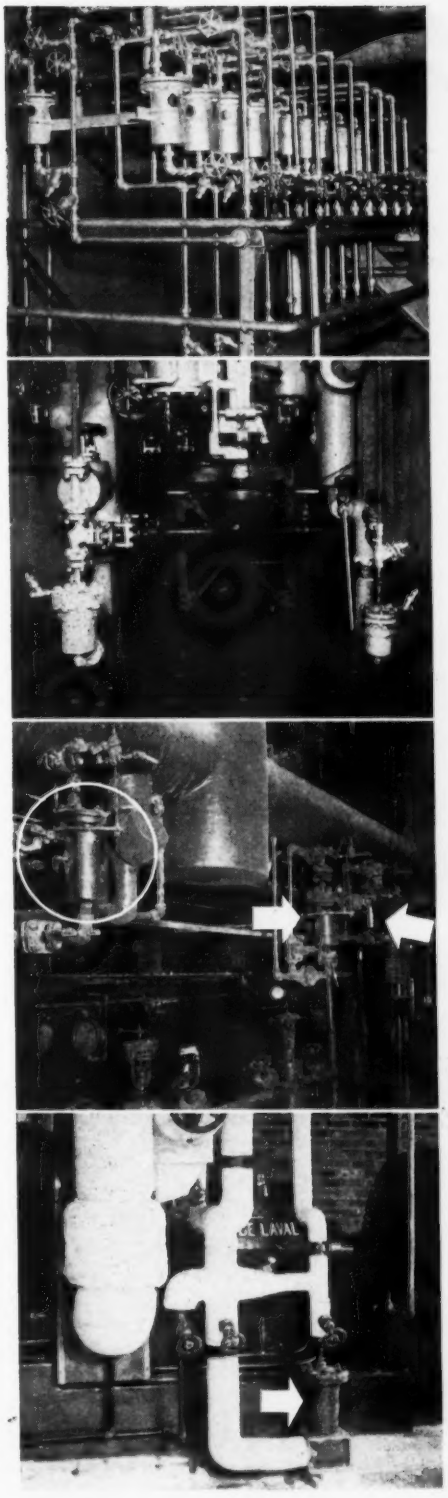


— with SCREWED CONNECTIONS



— or FLANGED CONNECTIONS

# f HIGH PRESSURE SYSTEMS



NCREASING attention in recent years to condensate drainage in high pressure systems and a broader use of odern steam traps has helped make possible the follow- g benefits in many plants:

1 *Positive protection of valves and equipment against condensate as well as carryover from the boiler — through location of traps ahead of all equipment subject to damage.*

2 *Standardization on all steel fittings — through use of forged steel traps exclusively, even in low pressure lines.*

3 *Completely automatic drainage to eliminate the time, and chance of human failure, involved when drainage must be given manual attention — by means of installing traps even at those points where condensation will normally occur only when starting up the plant after a shutdown.*

To help you secure these advantages Armstrong offers complete line of inverted bucket forged steel traps with reewed or flanged connections for pressures up to 2400 bs. and with capacities up to 300,000 lbs. of condensate er hour. These traps feature dependability, simplicity nd highest quality construction.

For data on Armstrong Traps, recommendations on trap ocations and suggested installation practice for maximum esults, write to Armstrong today.

**ARMSTRONG MACHINE WORKS**

**12 Maple Street • Three Rivers, Michigan**

*Manufacturers of Inverted Bucket Steam Traps, Steam Type Humidifiers and Automatic Refrigerant Gas Purgers.*

# Armstrong FORGED STEEL Traps

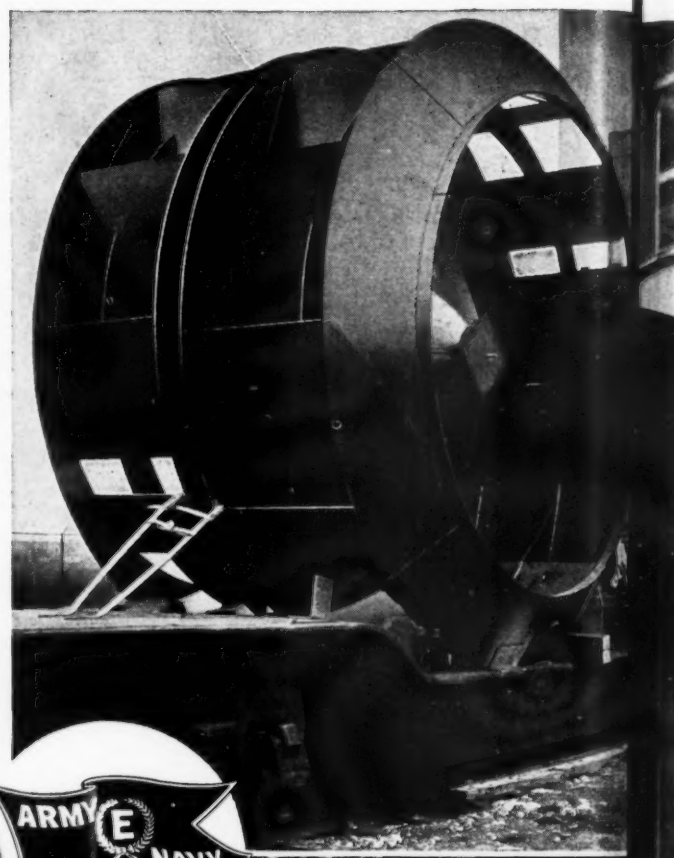
HOW TO SELECT the proper size trap, how to figure warming up loads, safety factors, heat loss curves, proper installation practice, physical data and prices of traps—these subjects and many others are covered in THE ARMSTRONG STEAM TRAP BOOK. Your copy will be sent gladly on request. Write for it today.

# *Progress and Power* in the

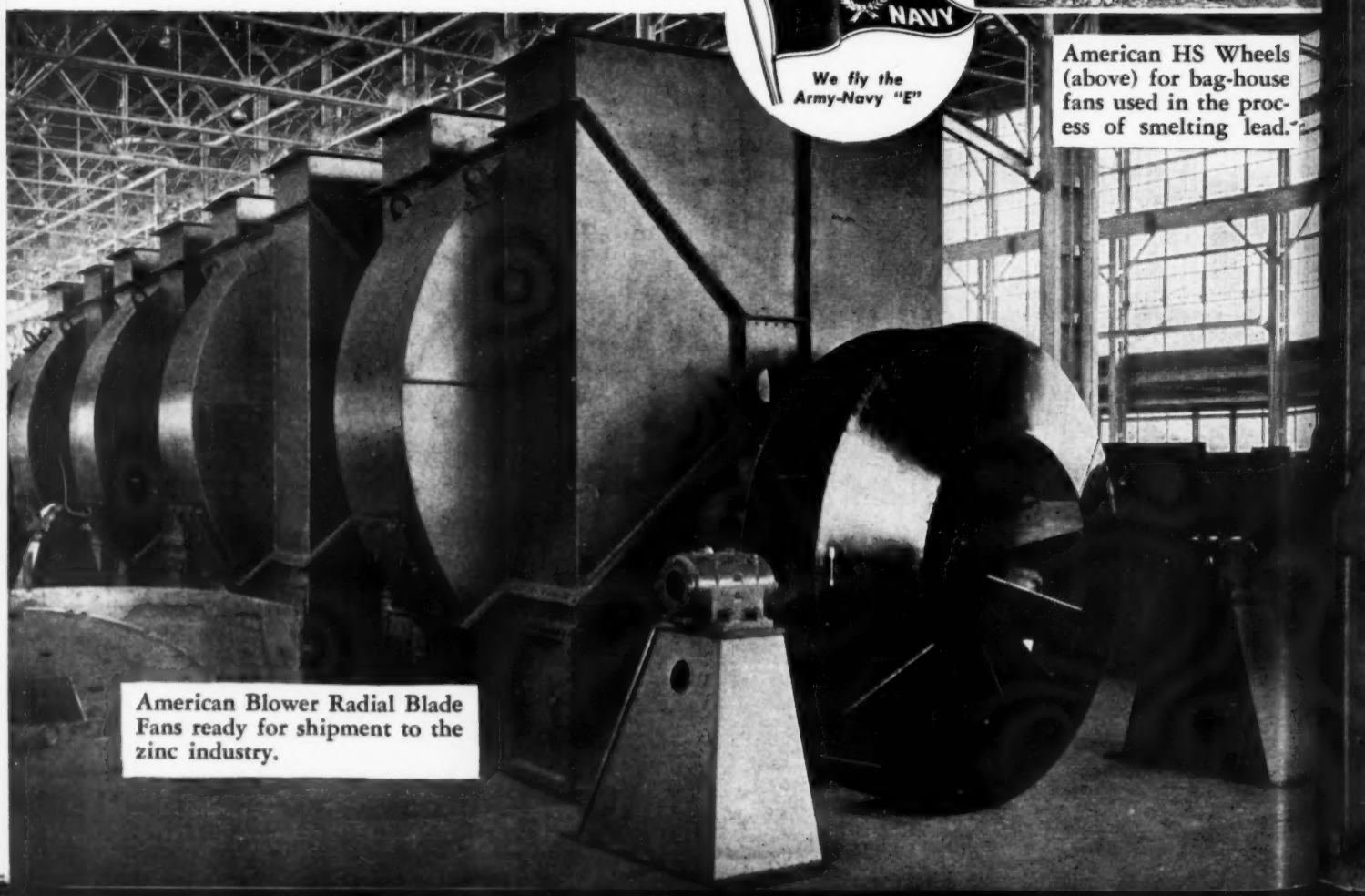
Industries, constantly expanding to supply more and more of the materials needed to win the war, have called on America's power producers to supply electric energy in tremendous amounts to turn the wheels.

The Utilities of America are equal to the task. Through the greatest network of power lines under one Flag, pulse the life streams of electric energy into the plants of the smelting industry and countless others.

American Blower Mechanical Draft Fans, Dust Collectors and other air handling equipment, and Fluid Drives, are serving both the Utilities and the war industries. We are continuing to build more and more of this vital equipment to meet the needs of America on the march to Victory.



American HS Wheels (above) for bag-house fans used in the process of smelting lead.



American Blower Radial Blade Fans ready for shipment to the zinc industry.

# AMERICAN BLOWER

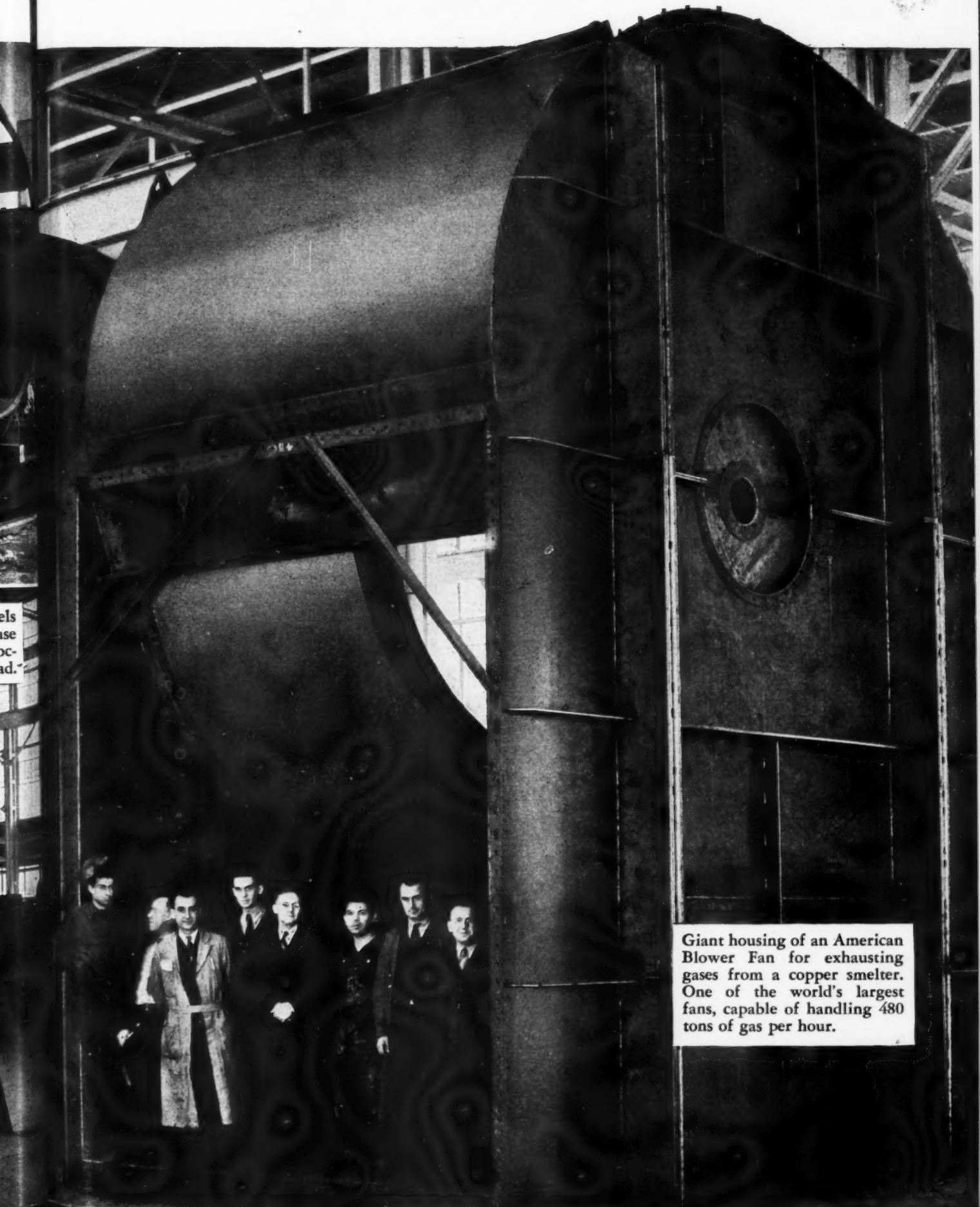
**AMERICAN BLOWER CORPORATION, DETROIT, MICH.**
**CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.**

Division of American Radiator and Standard Sanitary Corporation

ARMY E NAVY

*We fly the Army-Navy "E"*

# SMELTING INDUSTRY



Giant housing of an American Blower Fan for exhausting gases from a copper smelter. One of the world's largest fans, capable of handling 480 tons of gas per hour.

# ...back from danger

Safe on the carrier's deck, the Wildcat returns from a mission of danger! The giant Wasp engine in its nose has roared it to Victory—and brought it back, safe.

The engineering problems represented by these 18 powerful cylinders are staggering. Take the matter of reduction gears alone. Stepping down the high speed of the whirling crankshaft to the necessary slower propeller revolutions requires gears of such light weight and such extreme precision that only a slight variation would quickly spell their destruction. And yet, the flow of engines coming off production lines to power the world's mightiest air armada demands that these gears be produced by the hundreds of thousands.

And making these gears is Foote Bros.' job—a job that only a few months ago was considered well nigh impossible. How new production techniques—new engineering developments—resulted in the present production that keeps three plants of Foote Bros. Gear and Machine Corporation busy cannot be revealed until the war is won. But when "V" Day comes, these manufacturing know-hows can be applied to the making of precision gears for any product where close tolerances can aid in securing better performance and greater economy.

FOOTE BROS. GEAR AND MACHINE CORPORATION • 5225 S. Western Boulevard, Chicago, Illinois

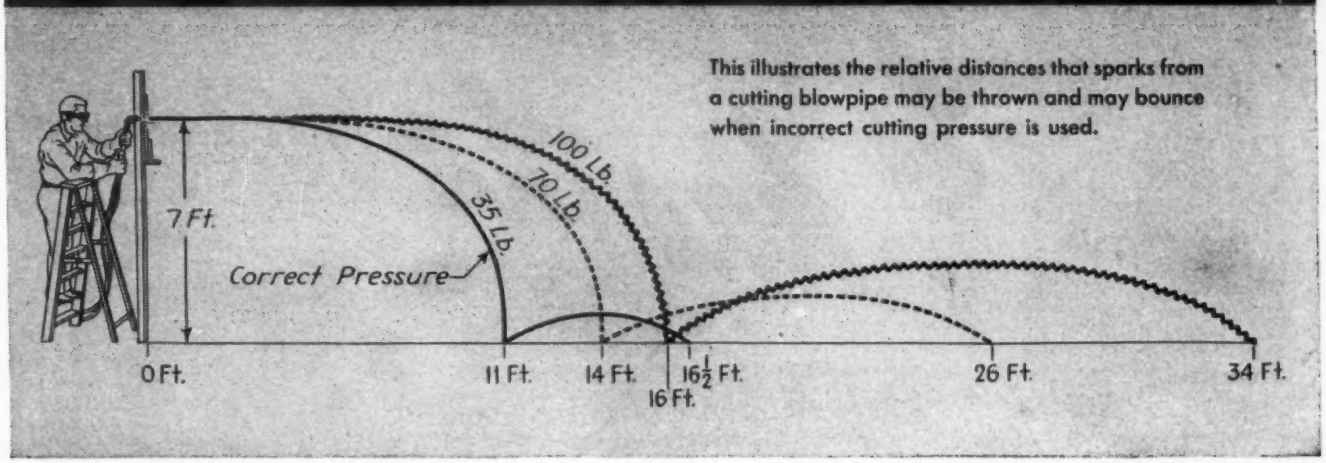
The Grumman Wildcat pictured here has been the Navy's first line fighter since Pearl Harbor. O'Hare, Thatch, Gayford and other Navy Aces became famous in the cockpit of this tough plane.

ARMY NAVY

FOOTE BROS.

*Better Power Transmission Through Better Gears*

# WATCH THOSE *Sparks*.. TO MINIMIZE FIRE HAZARD




During oxy-acetylene cutting operations, the larger the area into which sparks are thrown, the greater will be the danger of fire. Sparks scattered several feet from the scene of cutting may lodge in cracks or crevices of combustible material and smoulder there unnoticed until flames burst forth. Sparks should, therefore, be confined to as small an area as possible.

## Avoid Excessive Pressures

A most important factor in controlling sparks is the use of no more than the correct oxygen pressure as specified in the instructions supplied with each blowpipe. Excessive oxygen pressure not only wastes oxygen, produces an inferior quality of cut, and slows cutting by the cooling effect of the excess oxygen, but also increases the distance that hot slag or sparks are thrown—particularly when the cutting is done in a horizontal position.

## Use a Spark Shield!

An effective shield, which will reduce the distance that sparks are thrown, can be improvised by suspending sheet metal or asbestos paper 2 or 3 feet square, in the path of the sparks about 18 inches from the blowpipe. Such a shield will prevent sparks from flying or rolling great distances and will thereby lessen the danger of fire.

## Instruction Books Available

The instruction books packed with all oxy-acetylene blowpipes supplied by Linde include charts showing correct gas pressures to be used. Duplicate copies will be sent, without charge, upon request. Be sure to specify the blowpipes you have.

Also available from any Linde office is the booklet "Preventing Welding and Cutting Fires."

MARITIME "M" AWARD FOR OUTSTANDING PRODUCTION ACHIEVEMENT

**THE LINDE AIR PRODUCTS COMPANY**

*Unit of Union Carbide and Carbon Corporation*

UCC

General Office: New York, N.Y. Offices in Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

LINDE OXYGEN . . . PREST-O-LITE ACETYLENE . . . UNION CARBIDE
OXWELD, PUROX, PREST-O-WELD APPARATUS . . . OXWELD SUPPLIES

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd Street, New York, N. Y.

Please send me without cost —

1. Duplicate copy of the instruction booklet for each of the blowpipes specified below.

☐ Oxweld Type..... ☐ Purox Type.....
☐ Prest-O-Weld Type.....

2. The booklet "Preventing Welding and Cutting Fires."

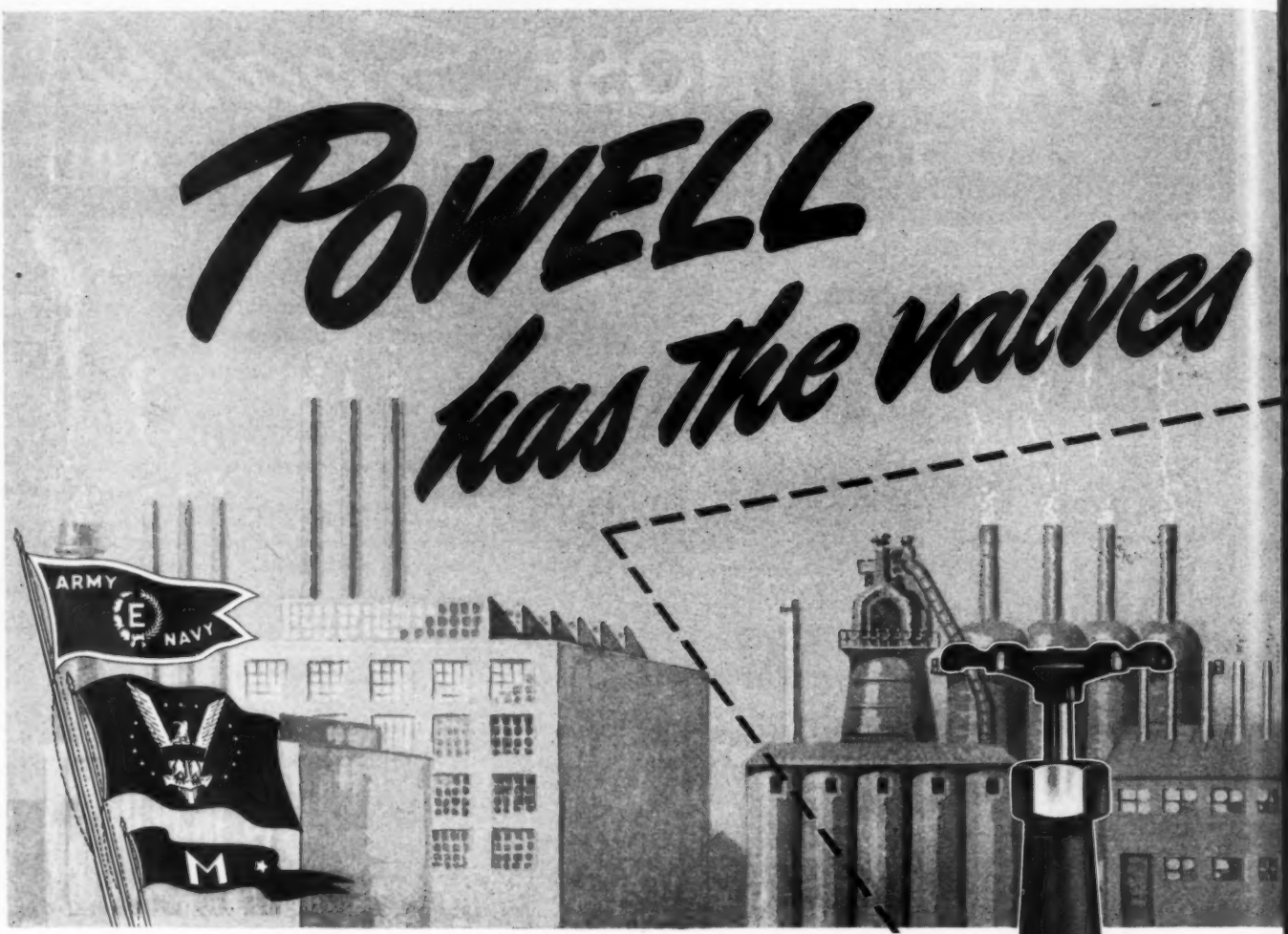
*Name* .....

*Street and Number* .....

*City and State* .....

The words "Linde," "Prest-O-Lite," "Union," "Oxweld," "Purox," and "Prest-O-Weld" are trade-marks.

# POWELL has the valves




From 1846, when Powell started making valves, until the outbreak of the "Global War", the pace of industrial progress was constantly accelerating. One after another, with ever-increasing rapidity, new products and processes were being evolved. And as each became a reality, Powell was ready with the correct valves.

Since Pearl Harbor the rate of acceleration has reached a peak. And—as in the past—Powell Engineering has been meeting every challenge★. Let us help you with any valve problem you may have—Powell has the valve you need—or we'll design one for you.

★For the contribution we are making toward winning this War, we have been honored with the Army-Navy "E", the Maritime "M" and the Victory Fleet Flag.

**The Wm. Powell Company**

***Dependable Valves Since 1846***

**Cincinnati, Ohio**

**Fig. 1460**

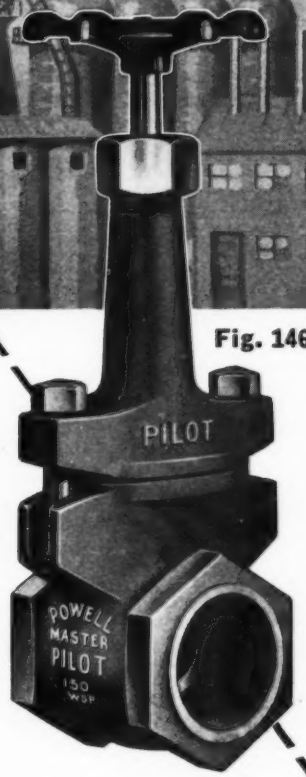



**Fig. 1460**—Iron Body Bronze Mounted "Master Pilot" Gate Valve. Screwed ends, bronze rising stem, bolted flanged bonnet and taper wedge bronze solid disc. Sizes ¼" to 2" for 150 pounds W. P.; 2½" to 4" for 125 pounds W. P. Also available in All Iron—Fig. 1462.

POWELL

Fig. 190

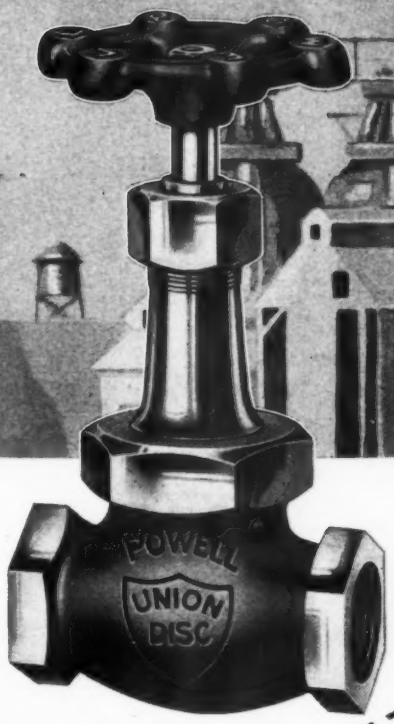



Fig. 150

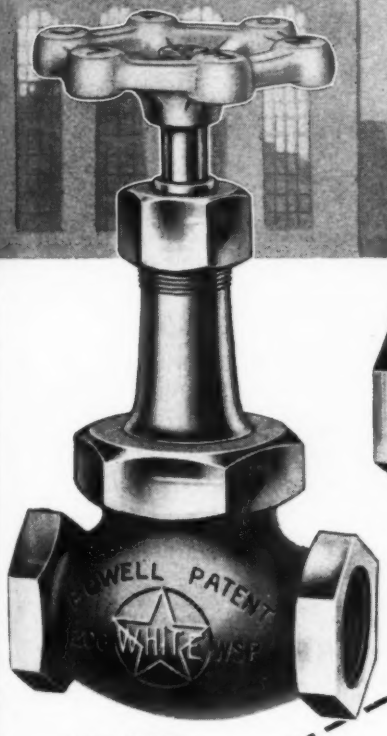



Fig. 1708

**Fig. 1708**—Bronze "White Star" Globe Valve for 200 pounds W. P. Screwed ends, union bonnet, renewable seat, and regrindable, renewable hard bronze plug-type disc.

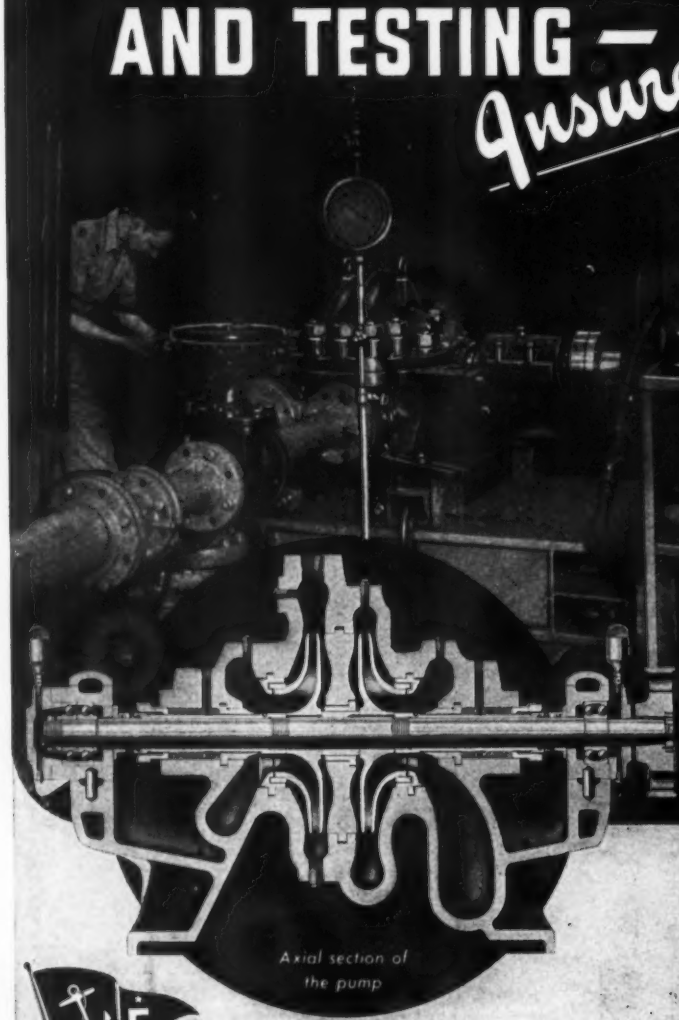
**Fig. 150**—Bronze "Union Disc" Globe Valve for 150 pounds W. P. Screwed ends, union bonnet and renewable vulcanized composition disc for steam service. Special discs are available for hot or cold water, gas, high temperature steam, etc.

**Fig. 190**—Iron Body Bronze Mounted "Irenew" Globe Valve for 150 pounds W. P. Screwed ends, union bonnet and regrindable, renewable hard bronze plug-type seat and disc.

# VALVES

# RIGID INSPECTION AND TESTING — Ensure High Quality

Opposed impeller centrifugal pump on test



Axial section of the pump

The highest quality of engineering design and of workmanship has always been the ideal of the De Laval Steam Turbine Company. High grade machines can be produced only by care in selecting and purchasing materials and by the use of specialized equipment, including precision tools, gages, jigs and measuring devices, followed by limit-gage inspection of finished surfaces and by thorough testing of completed units.

The testing here shown of a two-stage De Laval Pump is typical of the routine testing of De Laval centrifugal pumps. The pump is driven by a calibrated motor and accurate readings are made of speed, pressure, delivery and power consumption over the working range. The unit is then dismantled and all working surfaces are again inspected and checked. In some cases a torsion meter is used for determining input.

A similar procedure is followed with De Laval steam turbines, helical and worm gears, centrifugal compressors, and rotary displacement oil pumps.

The testing equipment includes suitable gages and meters for measuring power and fluids of all kinds and at various pressures and temperatures, also plant for generating steam at high pressure and temperature and for producing high vacuum.

M-34

**DE LAVAL** *Steam Turbine Co.*
TRENTON, N.J.

MANUFACTURERS OF TURBINES . . . STEAM, HYDRAULIC, PUMPS . . . CENTRIFUGAL, CLOGLESS, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, PROPELLER, PRIMING SYSTEMS; CENTRIFUGAL BLOWERS and COMPRESSORS; GEARS . . . WORM, HELICAL, and FLEXIBLE COUPLINGS

MAY
1943

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NUMBER 5

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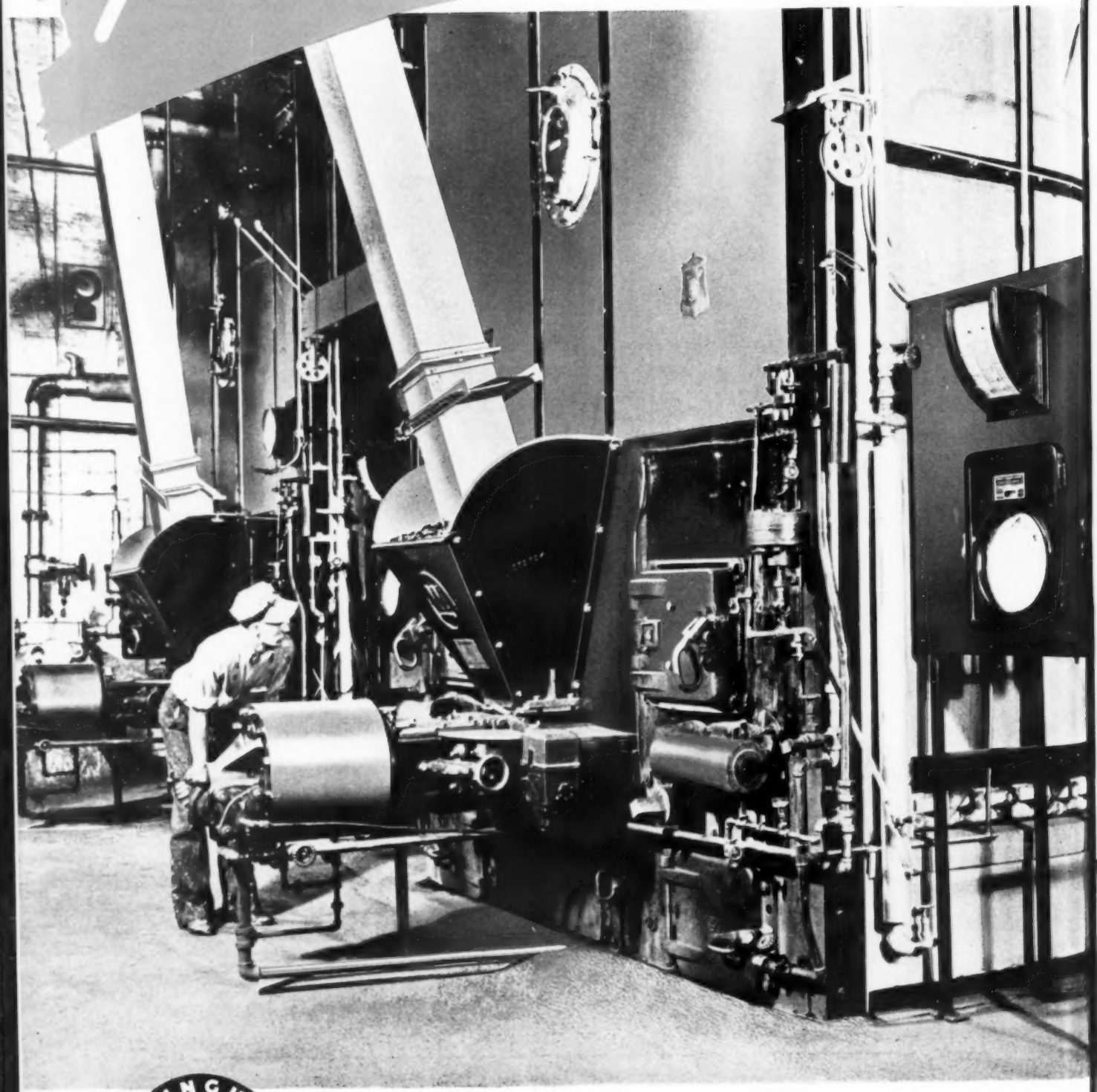
# Here's practical help



Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

# TO KEEP STOKERS in *fighting trim*

Your stokers are helping to fight the war on the production front. It's just as vital to keep them in top operating condition as to protect any piece of production machinery against breakdown—because down time for stoker repairs usually means lost production somewhere in the plant.

Westinghouse offers you a complete, down-to-earth maintenance program to keep your stokers in fighting trim. It is based on practical operating and maintenance information that the men in your plant can and will *use.*

Put the plan to work in your plant. Just follow the four steps listed below.

1 **SEND FOR OPERATING GUIDE** and Check Chart, which give basic operating and maintenance information on Westinghouse single-retort stokers.

2 **TELL YOUR MAINTENANCE MEN** about the importance of this program, and outline the plan to them.

3 **SET UP REGULAR INSPECTION PERIODS**—covering all points included in Operating Guide and Check Chart.

4 **SET UP INSPECTION RECORD SYSTEM**—using the inspection summary suggested in the Operating Guide.

J-50428

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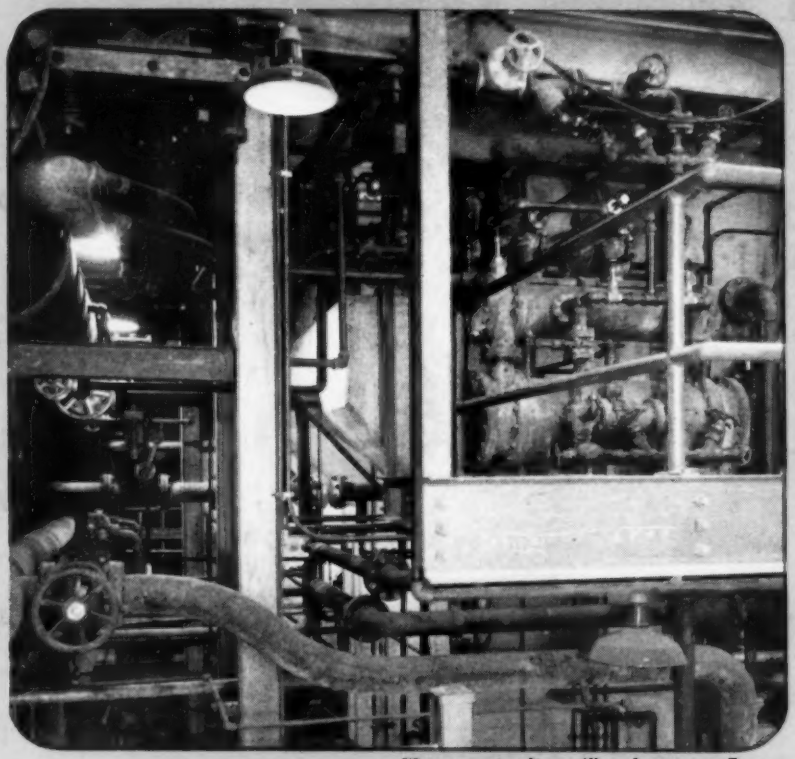
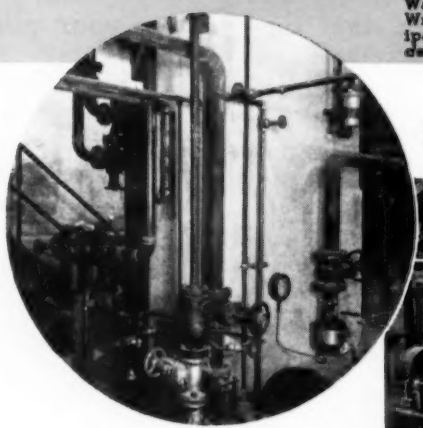
# This Indiana Electric Plant *arms against corrosion*

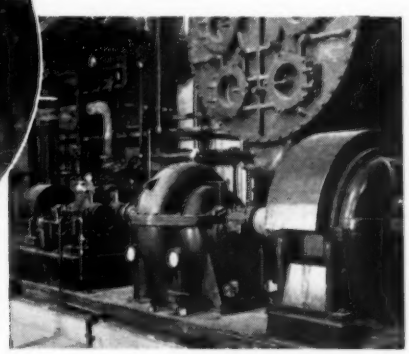
## BYERS WROUGHT IRON



Water service lines 4" and over are Byers Wrought Iron. Byers has hundreds of municipal water analyses, which help to *predetermine* and combat corrosive conditions.



All circulating water lines 4" and under in the Frankfort Plant are Byers Wrought Iron.



Condensate lines are Byers Wrought Iron. Some WI pipe was also used in the sprinkler system.

Electric plants, important though they are in peacetime, are doubly important today, for they generate 60% or more of the power required for war production. The importance of dependability in equipment has doubled, too.

As every engineer well knows, dependability in piping depends on good pipe "specs" . . . and there is no substitute. In the recently completed plant of the City of Frankfort, Ind., Mr. Alonzo Krug, City Engineer, and Froelich & Emery, engineers, specified wrought iron in lines where experience warned of severe corrosive attack. Water service lines 4" and over, circulating water lines 4" and under, and condensate lines, are Byers Wrought Iron. All these selections are endorsed by past plant experience under similar corrosive conditions.

Maybe there are some services in your plant where materials previously used can't stand up under today's accelerated operations, or where some special materials once used are no longer available. If so, you can draw on the experience of hundreds of other plant engineers in determining whether wrought iron will solve the problem for you. Just write, and our Engineering Service Department will tell you of other engineers' experiences with wrought iron under similar conditions.

When you decide that wrought iron is the best material to use, and the government—by its rating—indicates approval, there is reasonable assurance that we can take care of your requirements. You can get first hand delivery information by contacting a Byers Field Service Man, the nearest Division Office, or Pittsburgh.

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# POWER

Established 1882 • PHILIP W SWAIN, Editor

On the industrial front modern wars start years before the shooting begins. Long before Pearl Harbor we were busy building planes, ships, tanks and other weapons.

The same is true of peace. Although the worst fighting is ahead, with no end in sight, peace is already a matter for present action as well as forward thinking.

The truth is that the reconversion *from* war is just as gradual a process as the original conversion *to* war. It takes years, and a big headstart, to switch a whole nation back from killing to the abundant life. That job has begun.

Already we glimpse telltale patches of blue among the war clouds—a little more steel and rubber for civilians, quicker deliveries on machine tools, a sharp cut in new war-plant construction, even a few plants starting to convert back to peacetime production—all this while food gets scarcer, the army bigger and the fighting sharper.

These opposites are not contradictions. At every stage of life man must prepare for the next. Farmers plant in the spring, lay in firewood in the fall and fix the roof when the sun is shining.

Herein is the justification, not merely for so-called "post-war" planning, but for something more urgent—"pre-peace" planning. Consider the farmer again. In the winter he may well ponder how he will spend the money he gets from next season's crop, but more immediately he must choose his seed for the spring planting.

Whatever the hard course of battle abroad, industrial executives and power engineers will be increasingly forced to make pre-peace decisions in 1943 and 1944, as they reshuffle equipment and buildings to meet the changing needs of war and the civilian economy. From now on every present operation must serve the future also, as far as may be without damage to the war effort.

Personally prudent, this double objective is nationally sound as well, because the Peace will be as hard to win as the War. Great forces will come to grips within our own shores. In particular, hundreds of war-established governmental agencies will not easily return the initiative to the people.

The great test will be the ability of private business to prevent unemployment by absorbing the workers released from fighting and war production. This is crucial, for the American people will certainly not again endure long-continued and widespread unemployment. To prevent it, the government would take charge of things, manufacture the needed jobs and incidentally run the banks, the utilities and most of what we now call private business.

"Security" of a sort would be bought by the destruction of private enterprise, personal freedom, material progress and the American national standard of living. For none of these could grow in the soil of the ultimate bureaucracy.

Every responsible man in industry must now start building his private platform—a personal and practical philosophy to guide his daily operations. If he plans to operate in a post-war free-enterprise economy —what some call "democracy," but is better named "capitalism"—he can know in advance that this traditional system will never be allowed to exist unless it keeps on producing the abundant life for most of our people. It can do that only by turning a lot of wheels at high efficiency. High production of much-desired things at low unit cost is the only formula for wide employment and buying power, a high and rising living standard for everybody.

The conclusion is inescapable: He who expects to live under free enterprise after this great War, will start now planning his operations, his machines and his plants to fit a future fast-moving age. He will figure on big production volumes, good wages, low costs through efficiency, vastly improved products.

In the midst of this greatest War we are already treading the path of the Peace. We must look where it leads.

# Drag Scrapers Offer Safe, Flexible Solution to Coal-Storage Problems

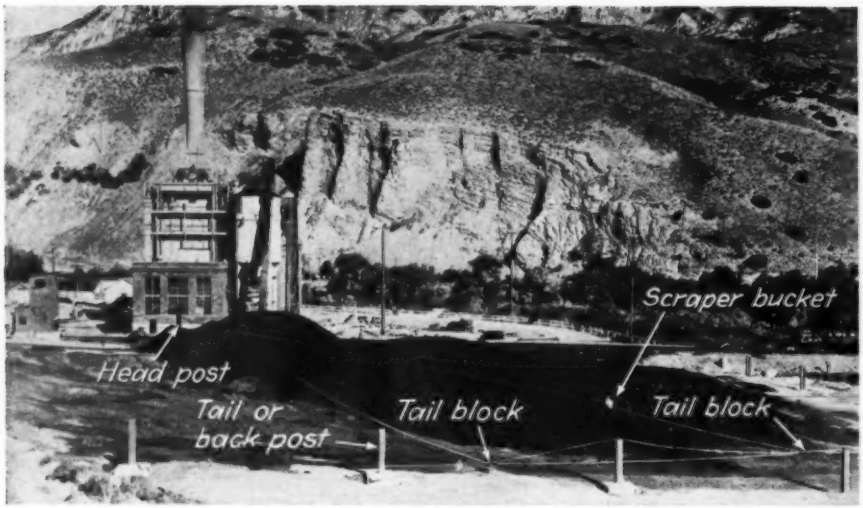


**Fig. 1 (top)—Typical installation with tail blocks on bridle cable. Fig. 2 (center)—For abrasive materials, such as the coke in the near pile, high posts keep tail block above top of pile. Fig. 3—Low back posts and high bridle towers for hillside storage**

► MANY REASONS justify storage of coal in substantial quantities: fear of shortages, favorable off-season prices, seasonal operation of water routes, and other factors—all play a part. Today, an added reason is the urgent need to ease the strain on war-burdened transportation and mining facilities, and to insure uninterrupted operation

Regardless of what conditions create the need, there are two primary requirements for successful storage: (1) protection from deterioration and fire, and (2) over-all economy. This is the first of two articles, based on 20 years' experience, showing how drag-scraper equipment measures up to these requirements and how to apply it to the widely varied conditions of coal storage.

### *Typical Drag Scraper*

Fig. 1 shows a typical drag scraper, essentially a simple device, consisting of a head post, carrying a set of blocks, and a series of tail posts, carrying a movable tail block or blocks. Cable from the scraper drive, located near the head post, passes over one head block and out to the scraper bucket. From the bucket, the cable goes to the tail block and then back to the other head-post block and the drive. Moving the operating cable carries the bucket back and forth across the storage space. To build the storage pile, the bucket works out from the initial pile near the head post, distributing the coal as desired. To reclaim coal from storage, the bucket is reversed to carry it from the pile toward the head post. Various kinds of standard coal-handling equipment form the initial pile and move reclaimed coal into the plant; some of the more common arrangements will be described later.

The three basic types of drag-scraper installations represent successive steps to minimize hand labor and provide for frequent lateral shifting of the line of operation. Result is successive decreases in labor while more easily forming a compacted layered-in storage pile—with coal sizes uniformly distributed. These basic types have (1) fixed tail or back posts, (2) semi-movable tail towers, and (3) fully mobile tail towers:

*Fixed tail or back posts:* In early drag-scraper installations, tail blocks, controlling the line of operation, were

***From 20 years' experience in developing drag-scraper equipment for both large and small plants, H A Roe, chief engineer, Sauerman Bros Inc, describes basic types and shows their adaptability to varying coal-storage conditions***

supported on back posts or on bridle cables stretched between the back posts. Manual movement of the tail blocks is required to change line of operation. This is the simplest installation, and is still used in many small plants and for temporary storage. Fig. 1 shows a typical one with tail blocks on bridle cables.

Considerable latitude exists in the relation between back-post height and depth of storage planned, with still wider latitude developing after installation is made. Actually, this relation involves distance and urgency as well as pile height so that no one answer fits all cases. Most installations have 8-ft back posts for 15- to 20-ft deep piles.

### *Handling Abrasive Fuels*

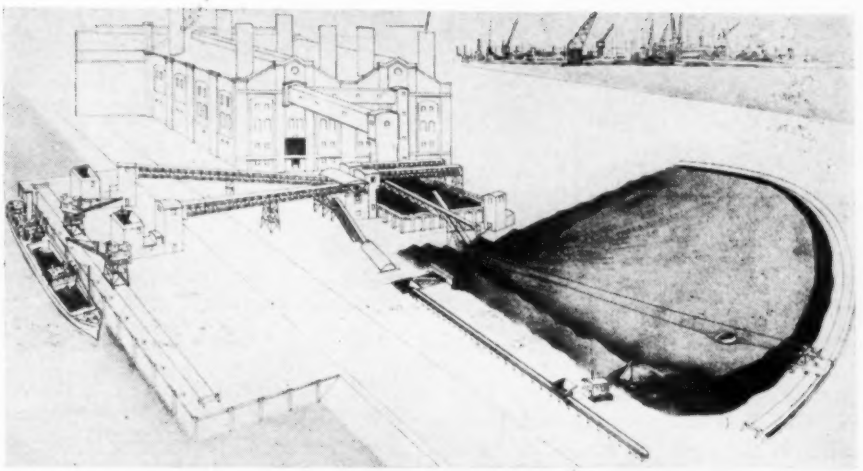
When handling abrasive fuels like coke, there are considerations which should lead to maintaining tail blocks at, or above, the plane of the top of pile. Fig. 2 shows identical storage areas planned to store and reclaim the same tonnage of coal and coke for a war-industries plant. Even with low back posts and height of coal pile exceeding that planned, operation is satisfactory. The coke storage calls for 40-ft posts and motorized shifting along the bridle.

Fig. 3 shows how to combine low back posts and high bridle towers to solve a hillside storage problem. Tail block on the scraper line is moved manually along back posts; tail block on the return line is moved manually between bridle towers by hand winches.

### *Larger Drag-Scraper Layouts*

*Semi-movable tail towers:* As public-service plants, which require larger units, began to install drag scrapers, tail blocks became too heavy for manual handling and weighted cars or tail towers came into use. If memory serves, the first installation of this kind was built in 1925 for Essex Station (N. J.) by the Public Service Production Co; engineers were W R Shem for the construction company and V M Frost for the operating company.

The plans provided for two 200-hp machines. They were big machines for those days, and there was some discussion of the feasibility of self-supporting tail towers of this capacity. I argued on the pro side, but used the wrong pencil



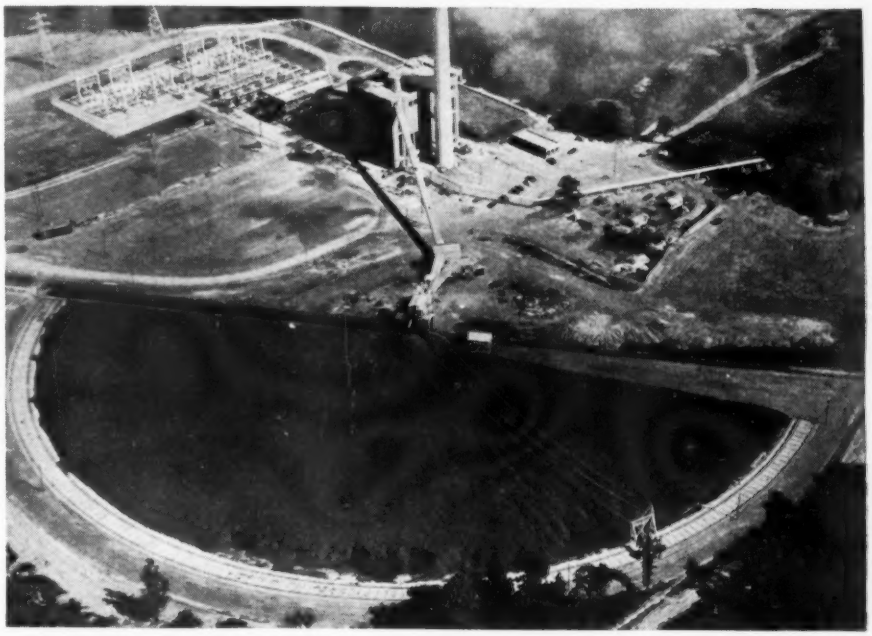
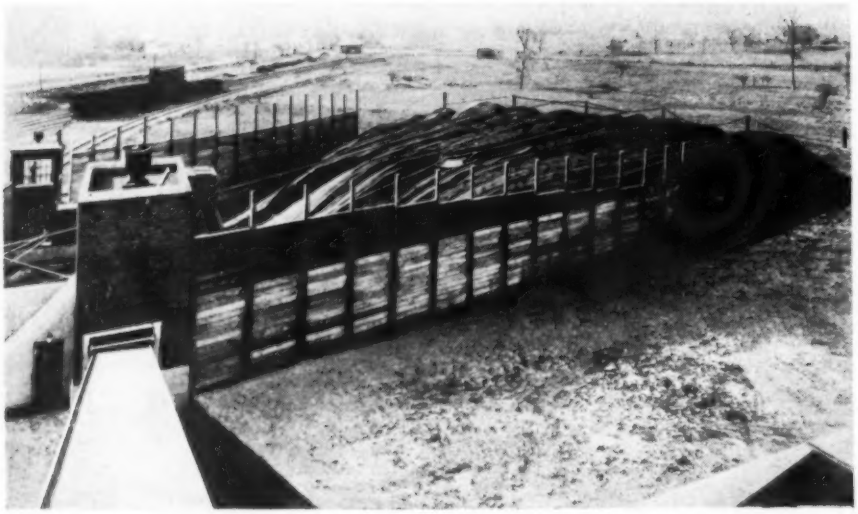


**Fig. 4 (top)—Semi-moveable-tail-tower installations at Irish municipal plant. Fig. 5 (center)—Typical large-scale storage using mobile tail tower. Fig. 6—Mobile towers, one with reloader, operate on parallel tracks for storage served by self-unloader boats**



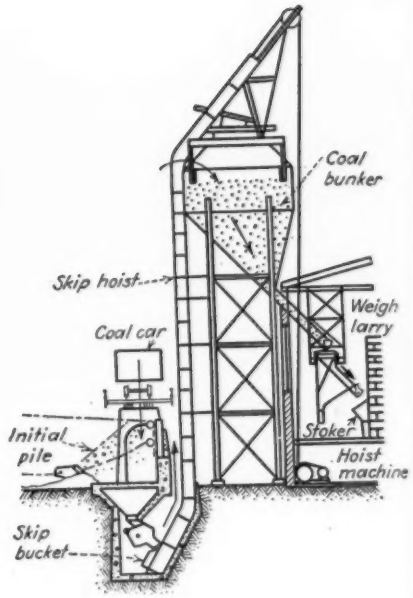



**Fig. 7 (left)—Small back-post installation served by rail. Fig. 8 (right)—Unloading setup using a trestle for cars and a skip hoist for handling to the plant**

and lost an order. The machines were built by R H Beaumont Co and Maine Electric Co, the contract being split. The Maine Electric machine was installed at the then new Kearny (N. J.) station instead of at Essex, as planned. These machines have been modernized.

Many such installations were made in the 20's, both in the United States and abroad. The largest were 300-hp units; two machines of this size, were installed for coal and coke-breeze storage at Vitry-Sud Station of Union d' Electricite, Paris.

### *Semi-Movable Tail Towers*

These low tail towers are usually designed for standard-gage track. Heights correspond generally to those of back-post installations (5 to 15 ft). Towers have outriggers and rail clamps to promote stability and to prevent travel, and may be motorized. In all cases, ease and frequency of movement are limited by outriggers or rail clamps or by interference of overtowering piles with lateral movement of operating cables. Fig. 4 shows a semi-movable tail tower at a municipal plant in Ireland, typical of a number of public-service plants in the British Isles.

*Fully mobile tail towers:* In 1927, I presented to J W Sykes, then chief engineer of the Wm A Baehr organization, arguments for a completely mobile tail tower, with movements to be controlled from the operator's station simultaneously with the drag scraper's in-and-out movement. It was contended that a high tower, free of outriggers and rail clamps, with propulsion motors and brakes controlled from the operator's cab, would result in such ease and frequency of movement as to revolutionize the storage situation. It would not only eliminate delays of ground crews, but would layer-in the pile and eliminate any concern for spontaneous combustion even with high-volatile coals.

As a result, Mr. Sykes, who had designed a scraper storage plant for another principal, Iowa Power and Light Co, adopted the idea for the new North Shore Coke and Chemical Co's gas-producing plant at Waukegan, Ill. This has been the prototype for all major installations since, despite changes in mechanical and electrical details.

Fig. 5 shows a typical large-scale storage using a mobile tail tower. Track radius is 500 ft, pile depth 30-40 ft. Cable carrying power lines to tail-tower motors, and control wires, is suspended between tail tower and conveyor head house. Control of all motions—scraper, tail tower and swivel chute for initial pile—centers in operator's cab at the head house. In some installations, tail-tower power and control lines are strung on trolley poles alongside the track.

**Towers of this type are completely stable against maximum live loads; motor brakes restrain travel**

**Fig. 12 (below)—Closeup of scraper-loader tower shown in Fig. 6, pg 67. The scraper stocks out and reclaims to railroad cars under the ramp, which is hydraulically controlled. A suspended conductor cable connects to the traveling tail tower**

In 1934, the Michigan Alkali Co took a further step in the application of drag scrapers to coal storage. F B Griffith, plant superintendent, and A D Harris, purchasing agent, argued for high and completely mobile parallel towers for an isolated storage to be served by self-unloader boats along an 800-ft dock. Coal was to be stocked back some 500 ft and reclaimed for haulage to several points in the plant. The proposal included a moving loading point, carried by one of two towers.

A suspended conductor cable was introduced between the towers, Fig. 6, to permit complete control of tower travel from the operator's cab. Use of suspended conductor cables supplying current to tail towers is typical now for radial layouts like Fig. 5 and for others that do not involve excessive variation in suspended length. On the original installation variation was 70 ft.

Installations described illustrate the major types of drag scrapers, but the essential flexibility of the equipment permits many variations. Although not actually part of the drag-scraper installation, interest attaches to equipment and methods to form the initial pile and to handle reclaimed coal.

### *Forming Initial Pile*

For small- and medium sized storage piles, coal is usually delivered by truck or rail. The initial pile may be formed by dumping from the truck, by means of a portable unloader working from truck or car, or by discharge from a hopper-bottom railroad car to a pit beneath the tracks or to the space formed by running the tracks up on a low trestle. Usually a skip hoist, bucket elevator or conveyor takes coal from point of discharge directly into the plant. The drag scraper piles the coal that is to be stored outside and later reclaims it to the foot of the same conveying device, to be carried into the plant.

Fig. 8 shows an unloading arrangement using a trestle and skip hoist. In Fig. 11, coal comes in by rail; the cars discharge to a pit beneath the tracks from which the drag scraper operates. Conveyor at left can move coal directly to the plant from the pit, or bring in coal reclaimed from storage.

For large-sized storage piles, coal arrives by rail or boat and usually justifies more or less elaborate handling and conveying systems. Fig. 9 outlines an arrangement that is quite common when coal comes by rail; Fig. 5 shows an actual case; Fig. 10 and 11 illustrate details. Cars discharge into a track hopper or are dumped by a rotary car dumper. A feeder in the hopper supplies a conveyor running up to a transfer point. Coal can be carried directly into the plant from the transfer point or routed over another conveyor to the storage pile. A swinging conical chute at the end of the latter conveyor forms the initial pile for the drag scraper. The scraper discharges reclaimed coal into a crater of suitable diameter over the conveyor feeder. This basic layout has any number of variations.

When coal is delivered by boat, unloading towers must be provided unless the boats are self-unloaders. Towers may feed directly into a conveyor system, as in Fig. 4, or may build the initial pile for the drag scraper. Special interest attaches to the parallel mobile-tail-tower installation in Fig. 6 because of the scraper-loader tower at the right, shown in detail in Fig. 12. Self-unloader boats deliver coal across the tracks to the dock area. The scraper distributes the coal and reclaims it to the hydraulically controlled loading ramp, Fig. 12. Loading ramp discharges to railroad cars underneath.

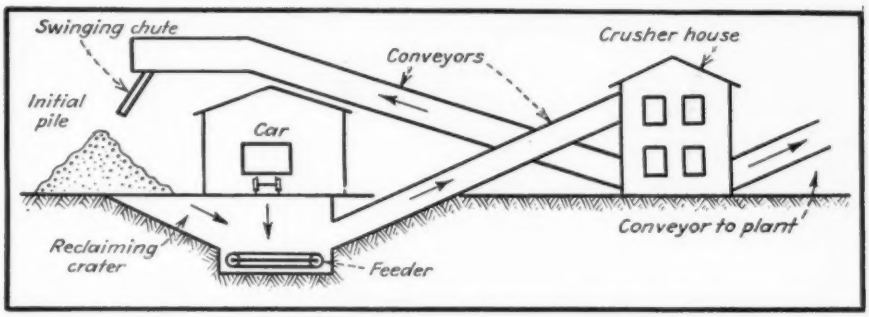
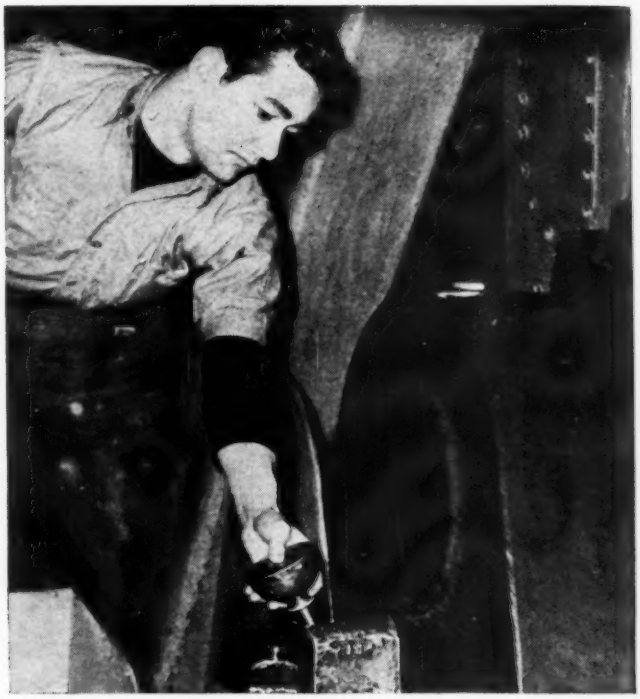


**Fig. 9 (top)—Common conveyor arrangement for handling coal from car to plant or storage and for reclaiming from storage to plant. Fig. 10 (center)—Typical junction with belt-conveyor system: revolving chute forms a kidney-shaped cushion pile and delivers coal where wanted by scraper operator. Scraper discharges reclaimed coal into a crater of suitable diameter over reclaiming-conveyor feeder. Fig. 11—Junction point with conveyor system; rotary car dumper speeds large-scale unloading**

# New Maritime Program Speeds Power Men to Sea Licenses

Captain G M Wauchope, U.S.M.S., Superintendent, and Lieut Comdr J D Kelly, U.S.M.S., Engineer Training Officer, stand alongside Sheepshead Bay's triple-expansion steam engine in the powerhouse where the trainees stand their watch



Classroom lectures covering practical theory are supplemented by actual contact with ship machinery. In this view an oiler bends over the main crankshaft of a vertical marine engine in motion to get the feel of reciprocating machinery

*Official U. S. Maritime Photos*

► A MINIMUM OF RED TAPE now stands between properly qualified power engineers with only shore experience and sea service as marine engineer officers. However, certain minimum physical and experience requirements have been definitely established to assure recruiting able and responsible men.

A new training program, lasting about five weeks, has been organized at the Sheepshead Bay (Brooklyn, N. Y.) Training Station of the U. S. Maritime Service, especially tailored to adapt the shore-acquired skill of power engineers to sea service. This class, under development for the past two months, should not be confused with other licensed-officer courses already under way at Fort Trumbull and Alameda for men who have sea experience and at Hoffman Island for engineering graduates and machinist trade apprentices.

Sheepshead Bay Station is admirably adapted for handling prospective licensed officers. Facilities for training 10,000 men at one time are devoted to schooling seamen, enginemen, pharmacist's mates, ship's clerks, stewards, cooks and bakers. In the engine department, the school trains oilers, wipers, firemen and watertenders. A more advanced course is provided for engineers.

On the site of the once fashionable Manhattan Beach, the Station's own power house, which supplies steam for heating, contains six exact replicas of Liberty Ship oil-fired watertube boilers and a triple-expansion steam engine with auxiliaries. Trainees stand regular watches. Actual conditions aboard ship are duplicated except that the building does not roll or pitch.

### *How Men Are Enrolled*

Approved applicants are enrolled in the U. S. Maritime Service in the grade of Fireman, third class, and assigned to the training station. On reporting there, enrollees are advanced to the grade of Chief Machinist's Mate at $126 per month salary and provided with quarters, food, uniform clothing outfit and study material. The U. S. Maritime Service provides transportation from the place of enrollment to the training station but does not reimburse enrollees for travel by private conveyance.

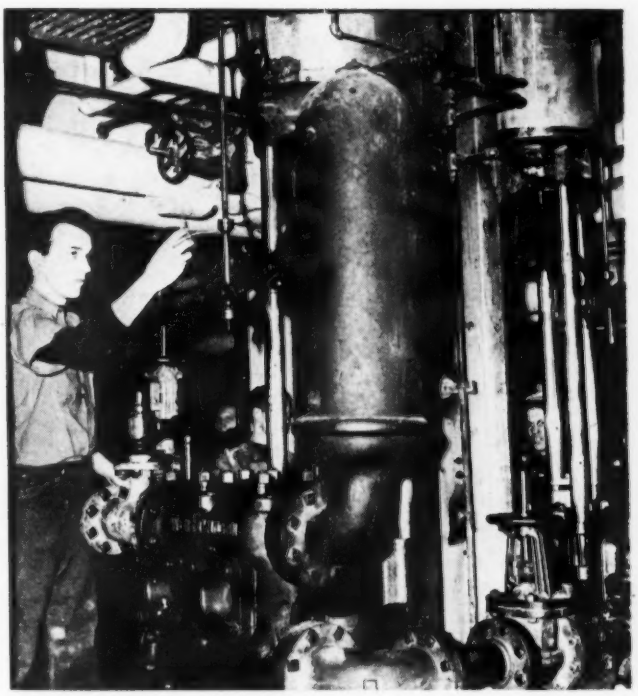
After the five weeks of basic training, candidates are assigned by the Recruitment and Manning Organization to merchant vessels, in the engine department. Some enter the Army Transport Service as junior engineers while others gain necessary sea experience as oilers or firemen aboard cargo ships.

The duration of unlicensed sea service, from three to twelve months, is determined solely by the candidate's shore experience. A man having several years' background of responsibility for all phases of power-plant operation, including modern moderate-pressure turbines or engines, oil-fired watertube boilers and auxiliaries, would not be expected to serve the full year's time at sea to demonstrate his ability to "take it" in heavy weather and to learn the ropes. With less extensive experience ashore even a year at sea might be considered inadequate to qualify a man for licensing as Third Assistant Engineer.

***Adequate background of shore experience qualifies power engineers for five-week training in marine methods at U. S. Maritime Service School. Officer candidates spend short period at sea before taking marine license examination***

By S A TUCKER, *Associate Editor*

Apprentice seaman lighting off one burner of an exact Liberty Ship boiler. Insofar as possible all the details of ship operation are carried out at the station to familiarize men with equipment construction and marine operating practice



Pumps and other auxiliaries, valves and piping are arranged as nearly as possible in the manner of shipboard to give every man an opportunity to learn differences between shore and marine equipment. Liberty Ships have steam-driven auxiliaries

Before being accepted for enrollment in the training station, a power engineer with only shore experience must satisfy the enrolling officer that his experience and physical condition are such that he can later qualify for a license. For this, the enrolling office of U. S. Maritime Service refers the applicant directly to the nearest Merchant Marine Inspector of the Coast Guard, the same individual before whom the prospective officer will later appear for license examination.

While candidates appear before local inspectors who must rely on their own judgment for preliminary sizing up of individual qualifications, all district offices of the Merchant Marine Inspection are guided by the emergency regulations for licensed officers published in the Coast Guard Bulletin for December, 1942. These rules require two years' experience as stationary engineer plus a full year in a ship's engine room or, alternately, a college degree in engineering or three years' service as a machinist's trade apprentice. Ultimately, the candidate's license as Third Assistant Engineer depends also on his ability to pass a written examination, but his right to sit for this examination depends on an evaluation of his experience by the Merchant Marine Inspector in charge of the local field office.

### *Well Rounded Experience*

While not specifically stated in the regulations, it is understood that the shore experience should be of a character and grade equal to that normally expected in an ocean-going vessel. Ship steam pressures range upward from 200 psi; engines and turbines are 2500 hp or larger. Operators of low-pressure boilers or heating plants without prime-mover equipment cannot expect their experience to be rated equally with those who have had all-round background in up-to-date high-pressure generating plants.

Limited also is the specialist who has had experience only in the boiler room or turbine room of large generating stations. A well-rounded background is essential for the marine engineer's duties.

For men with diesel operating experience, the same criteria apply. They must establish two years or more experience in all-round responsibility for oil-engine plants comparable with marine installations. While they should have some background of steam practice to care for heating boilers aboard motor ships, the essential requirements demand only a working knowledge of 2- and 4-cycle engines, air and solid injection, single- and double-acting engines and opposed-piston engines.

A vital phase of any marine engineer's job, either steam or motor, is that of making emergency repairs at sea and carrying on other essential maintenance activities during short layover periods in ill-equipped foreign ports. For this, some experience in machine-shop practice is an important qualification. The marine engineer has at his disposal at least a lathe and drill press; he should be capable of operating them.

Men with adequate background have little trouble satisfying any Merchant

Marine inspector. Those who have acquired shore experience where stationary licenses are required are expected to exhibit such licenses as evidence of their experience, but the record counts, not the mere holding of the license itself. On the other hand, because of wide differences in stationary license requirements in various parts of the country, no man should hesitate to apply solely because he does not hold a certificate, provided his experience equals the requirements detailed herein.

### *Sound Physical Condition*

Before presenting his experience record, however, an engineer would do well to check up for himself on certain other qualifications. He must pass a medical examination to assure that he is physically capable of life at sea. His eyes need not be up to the standard required for deck officers, but they must meet minimum requirements. Briefly, these are expressed as 20/30 vision in one eye and 20/50 in the other with or without glasses. If glasses are worn, candidates must also be able to pass a test without glasses of 20/50 in one eye and 20/70 in the other. Color blindness is no bar to engineers but hearing must be reasonably near normal.

Officer candidates must be citizens of the United States and must furnish evidence of this fact. Certificate of birth or naturalization papers are normally required, but baptismal records and certain other documentary evidence are acceptable.

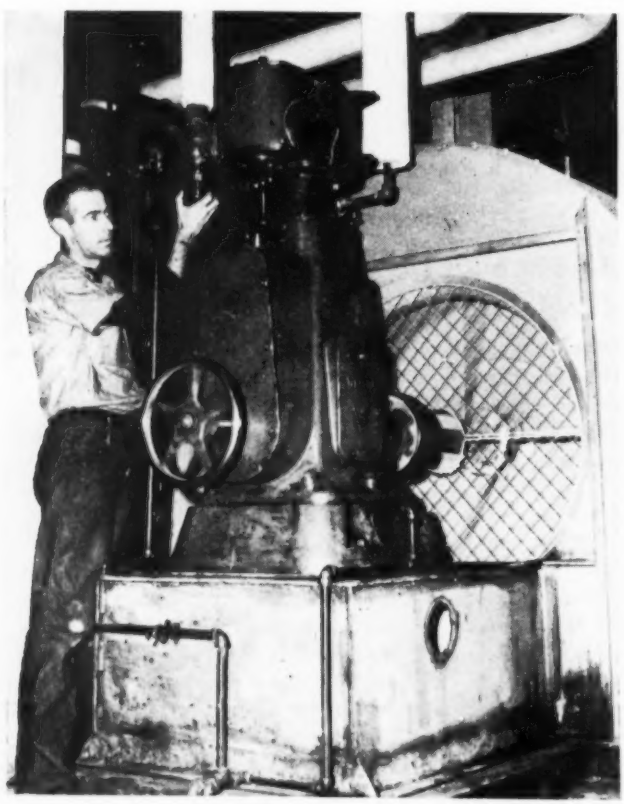
Once a man has assured himself that his qualifications are adequate and that he wants to become a marine engineer, he should write a detailed record of his experience for presentation to the inspector and this record must be certified by his employer. With this, his license and birth certificate, he can report to the nearest enrolling office of the U. S. Maritime Service. Information can be had at any branch of the U. S. Employment Service or office of the Recruitment and Manning Organization of the War Shipping Administration.

### *Inspector's OK Required*

After checking credentials, the enrolling officer refers the applicant to the local Merchant Marine inspector for certification that he is eligible to sit for marine engineer license examination after a period of sea service. Unless he can later qualify for a license on his experience record, he can expect no remission of required sea service because he has taken a 5-week training course.

While at the training station, officer candidates not only review practical fundamentals of boilers, engines, turbines and auxiliaries but also learn marine terminology, frame and bulkhead designations, rules and regulations, and duties of officers aboard ship. A brief review of practical mathematics and electricity supplements the program. In addition, every licensed officer must at some time obtain a certificate from the U. S. Public Health Service that he has passed a satisfactory examination based on an approved First Aid course. Full details on these requirements as well as information concerning passports and papers are made available at the training station.

While the training of stationary engineers is hardly yet well under way, the need for many more licensed engine officers in coming months justifies the expectation that the number of officer candidates will be gradually increased. Experienced marine engineers now in shore jobs are in immediate demand, but the number available becomes steadily fewer. Other training stations for engine men with 14 months of sea experience, for technical college graduates, and for men with three years' experience as machinist's trade apprentice are producing a steady flow of licensed personnel but the U. S. Maritime Service and the Recruitment and Manning Organization, both of the War Shipping Administration, are continually increasing their preparations for manning the growing Victory fleet to supply the no-longer-secret second front.



Trainee adjusts throttle of steam-driven forced-draft fan in the power house which furnishes heating steam to the station

*Official U. S. Maritime Photos*

Instructor with foot on thrust bearing housing uses public address system to make himself heard above machinery noise

# What Can We Learn from Britain's Fuel and Power Rationing?

***When we start a national conservation campaign here, as seems likely, will we remember that the success of the British program, described here by correspondent Robin Walker, hinged on keeping the public fully informed?***

The MINISTER of FUEL asks you to keep within . . .

YOUR FUEL TARGET for the year

1ST. JULY 1942 UNTIL 30TH. JUNE 1943

THIS COLUMN explains how many Fuel Units you should not exceed if you are to keep within your target, according to where you live and the number of rooms you use.

NORTHERN HOUSE ALLOWANCE

MIDLANDS HOUSE ALLOWANCE

SOUTHERN HOUSE ALLOWANCE

NUMBER OF ROOMS IN USE

IN ADDITION YOUR PERSONAL ALLOWANCE is 15 Fuel Units per year, which equals 7½ cwts. of coal or a corresponding amount of other fuels. Every child is allowed this personal allowance.

THE demands of total war make it essential that we should use less fuel in our homes. We must release fuel from the domestic front so that it may be used for war-work in industry.

THE BATTLE for FUEL

**The Battle is on . . . The Battle is vital . . . Every citizen is entitled to say "Give me my Battle Orders; tell me what to do."**

Here are YOUR Battle Orders. This announcement tells you how to find out YOUR FUEL TARGET for the year. Keep *within* your Target by doing with less fuel and we shall win the Battle for Fuel.

Watch your fuel consumption day by day and week by week to make sure you are keeping inside the target. Watch the Press and listen to the B.B.C. for advice on making the best of your share.

We will work together and show that a free people can freely make the sacrifices necessary for victory.

WHAT YOU DO

1. Find out your Fuel Target (in fuel units) from the Column on the left. See the examples at the foot of the right-hand column.

2. Divide Fuel Units amongst the different kinds of fuel you use. Refer to the Fuel Unit table in the right-hand column.

*Cut out this advertisement for reference*

FUEL UNIT

1 FUEL UNIT EQUALS ¼ Cwt. of Coal or Coke

1 FUEL UNIT EQUALS 500 Cubic Feet of Gas

1 FUEL UNIT EQUALS 50 Units of Electricity

1 FUEL UNIT EQUALS 1 Gallon of Paraffin

EXAMPLES OF HOW TO WORK OUT YOUR TARGET

Issued by the Ministry of Fuel and Power

**Huge advertisements like this, in newspapers and virtually every printed publication, told the story of the Target Plan**

▶ WHEN BRITAIN WENT to war, fuel went to war, too. But the general public failed to realize its strategic importance until, in 1942, a fuel crisis loomed and public and Parliamentary attention focused on the need to save fuel and fuel-produced power. It was then that the famous Beveridge report on fuel rationing was introduced and debated.

The report suggested that each family be regarded as a unit and all fuels be given a point value, to be rationed on a specific plan. This remarkable scheme was not fully adopted but its essence was retained in later efforts to gain by voluntary effort what was originally to have been handled by rations.

It was perfectly obvious at the start that gas and electricity could not be rationed in the sense that coal, coke and fuel oil could. Only after meter checks showed excessive consumption could any action be taken. In wartime Britain where there are not enough men to produce fuel, there are certainly none available for meter checking to catch fuel wasters.

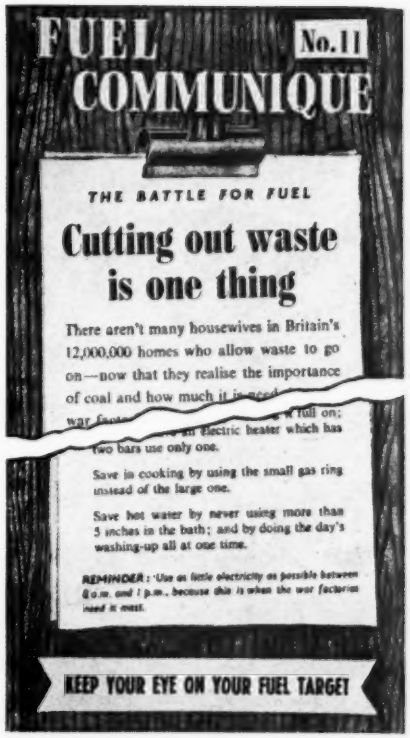
In that dilemma there was only one course to take, and it has been taken. The public were fully informed of the tragic results of fuel waste and asked to do all they could as volunteers to prevent an acute shortage that would stop war plants, slow down transportation and greatly handicap the war effort. Publicity on a scale never previously attempted was agreed on and a sustained program planned to carry on as long as the situation demanded.

This publicity aimed at several results: (1) elimination of every possible waste of fuel of any type through voluntary control by consumers, (2) maximum efficiency in coal production and its most efficient use in industry,

(3) reduction of domestic power consumption to release generating capacity as well as fuel to industry.

Everyone realized that there was a vast wastage of fuel. As a nation, we had been accustomed to plentiful and cheap coal, gas, electricity, and even oil, and in many cases supply corporations penalized those who used too little by applying minimum consumption charges. The job was therefore essentially a psychological one—to convert a nation of fuel wasters into a nation of fuel savers.

To fire the first shot in the campaign, the newly created Ministry of Fuel and Power told the story of the "Target Plan" in huge advertisements in every newspaper and most other printed publications. These asked each family to work out their "fuel target" based on number of rooms in the home and number of residents. The target was expressed in *fuel units*—one unit being equal to 50 lb of coal, 500 cu ft of gas, 50 units of electricity, or 1 gal of paraffin. This plan gave each member of the British public a goal to strive for—a goal that was regarded generally as giving only a minimum of comfort in a country where winter can be severe in its raw coldness.


FUEL COMMUNIQUE No. 11

THE BATTLE FOR FUEL

Cutting out waste is one thing

There aren't many housewives in Britain's 12,000,000 homes who allow waste to go on—now that they realise the importance of coal and how much it is needed

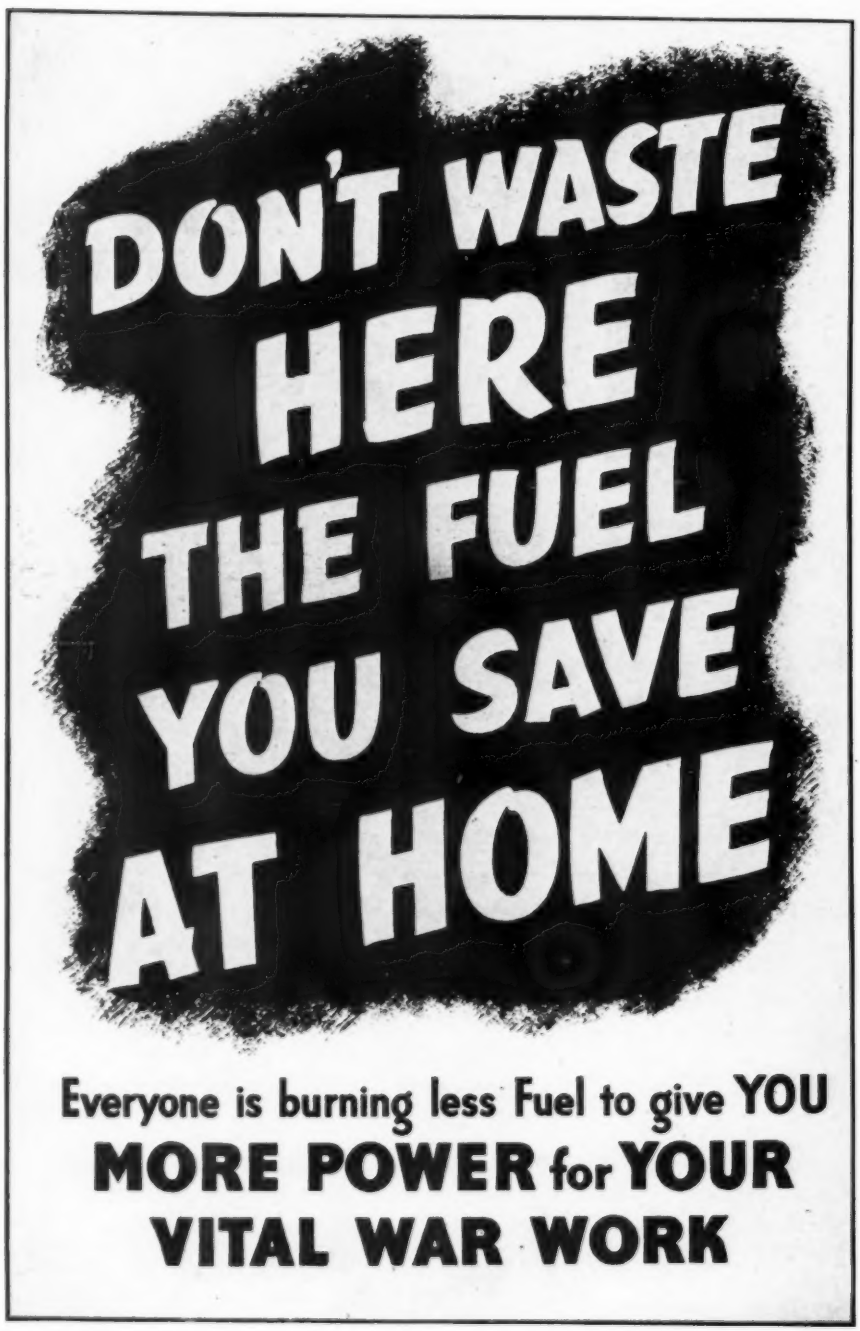
Save in cooking by using the small gas ring instead of the large one.

Save hot water by never using more than 5 inches in the bath; and by doing the day's washing-up all at one time.

REMINDER: Use as little electricity as possible between 6 o.m. and 1 p.m., because this is when the war factories need it most.

KEEP YOUR EYE ON YOUR FUEL TARGET

**Weekly ads, in the form of "fuel communiques," maintain interest in fuel saving by reminders and helpful hints**




**Typical poster sells fuel saving on the British industrial front—part of a campaign that also includes ads in industrial magazines, stickers on light switches, etc**

Coincidentally, the government introduced limitations on the sale of coal and paraffin. The tonnage permitted has varied, but now stands at one ton per household for the three months, January through March. Thus, in the most severe period of our year each household receives about 150 lb of coal per week, irrespective of size of house or number of residents.

### *Fuel Communiques*

To create a mental atmosphere that encourages acceptance of this stringent limitation, the Ministry of Fuel and Power has continued its press advertising. The ads appear weekly in the form of "fuel communiques" and are numbered to suggest reports from a battle front—as they are, though it isn't as sensational a front as North Africa or the Russian steppes. Each communique touches a particular aspect of fuel saving. One asks the public to stop using electricity at the peak period, another urges sharing family fireside and lights with neighbors, another gives practical pointers on heat saving by use of insulation, while still another, aimed at the inevitable loss of enthusiasm in any drive, says "Do Not Relax."

Joining in this campaign, one of the most important tried anywhere, electrical manufacturing firms, power and gas companies and oil firms have keyed

(*Continued on page* 138)

Putting an ac generator into service for the first time is the culmination of many weeks of patient planning and work, so take care that everything is in order for the machine to go on the line safely

# Have You Ever Put a New AC Generator in Service ?

***If not, here are all the tricks, as set down by James Wilson, of Knoxville, Tennessee. They insure correct connections for parallel operation with the rest of the plant before closing the switch for the first time***

▶ WARTIME POWER LOADS have brought many problems that may not have confronted operating engineers before—for instance, putting an ac generator into service for the first time. If the machine is a new one, the manufacturer's engineer is probably in charge. But if the plant engineer is taking the responsibility for a secondhand machine, the following suggestions will be helpful.

### *Preliminary Work*

Putting an ac generator into service is the culmination of many weeks of patient planning and work. The investment is considerable and the additional power may be badly needed, so be careful in these last steps. The switchboard has been set up, connected and checked, either according to the manufacturer's instruction or by his crew. The check should include an electrical test loading and operation of all circuits, as well as careful mechanical inspection of all wires and connections. Run the prime mover several times to test the governor action. Adjust it, if necessary, until the unit runs steadily, and test the overspeed trip several times. When these preliminaries are completed, the field rings and the exciter commutator should begin to acquire a polish.

Before applying excitation to the generator field coils, the stator winding insulation must be tested to make sure that it will stand operating voltage. First, make an insulation-resistance test. This may be done, as in Fig. 1, with a Megger, which contains a hand-cranked high-voltage dc generator and a high-resistance voltmeter calibrated to read megohms. One of its terminals connects to the leads from the alternator and the other to the machine's frame. Then when the Megger crank is turned at the correct speed and its pointer remains steady, the insulation resistance of the machine's windings is read directly in megohms. A minimum safe value of insulation resistance for a generator or motor may be determined from the AIEE formula:

Insulation resistance in megohms = rated terminal voltage ÷ (rated kva + 1000). Assume a 1000-kva 2300-v generator. Then it should have an insulation resistance of at least $2300 \div (1000 + 1000) = 1.15$ megohms. In no case should it be less than one megohm and normally it should be much higher.

If a Megger is not available, insulation resistance can be measured with a voltmeter and a source of dc, as in Fig. 2. The voltmeter should have a scale range greater than the test voltage, and a resistance of at least 100 ohms per volt of scale. For example, if the voltmeter has a 300-v scale range, then it should have a resistance of $300 \times 100 = 30{,}000$ ohms. Insulation resistance may be found by the formula:

$$R = r\left(\frac{E}{e} - 1\right)$$

where $E$ equals the test voltage (best value 500 to 600 v), $e$ the voltmeter reading, and $r$ its resistance.

Assume a test voltage of 240, resistance of voltmeter 30,000 ohms and

a reading of 5 volts, then the insulation resistance:

$$R = 30{,}000\left(\frac{240}{5} - 1\right) = 1{,}410{,}000 \text{ ohms, or } 1.41 \text{ megohms}$$

If the insulation resistance tests low, the windings must be dried out. Usually the most satisfactory method is to run the generator short circuited. The stator leads are short circuited at such a place that the armature current can be read on the switchboard ammeter. When the unit is running at low speed, enough field current is applied to generate about 10% of normal full-load current. Increase the current slowly so that 20 hours are required to raise the temperature to 80 C (176 F). Do not exceed this temperature or increase the current beyond full-load value without consulting the manufacturer.

### *Drying-Out Operation*

If full load-current does not raise the temperature to 80 C, restrict the ventilation, but not in such a way as to cause local hot spots in the windings. Unless they are equipped with temperature coils, measure the temperature by thermometers held in various locations in the end winding. The thermometers may be held in place with glued felt pads, wads of putty or pieces of waste tied in place, but do not permit these attachments to block winding ventilation in any way.

The drying-out operation drives out the moisture through the natural pores of the insulation in reverse to the way it entered. Too rapid heating may develop local pressures that will force new passages through the insulation and ruin it. Likewise, the temperature through the windings should be as uniform as possible to prevent driving the moisture from one section to another.

When the desired maximum temperature is reached, it must be held practically constant until insulation resistance reaches a desired value. This resistance is measured periodically, excitation being removed from the field coils for the few minutes necessary. Plot a curve of insulation resistance and continue drying until the curve flattens decidedly for several hours. After the drying run is over, make several insulation tests, noting the temperature for each one, as the generator cools. Plot this curve, which is almost a straight line, on logarithmic paper and save it for future periodic insulation-resistance tests.

When the insulation is dry and cool, the next operation is the high-potential test. Ordinarily smaller plants are not equipped to make this test, so it is best to hire a service engineer and equipment from one of the major electrical manufacturers. It is desirable not to omit the high-potential test on units of 400 kva or over. If it is omitted, then the over-voltage overspeed test can be made to simulate a possible runaway from full load. This test is made by exciting the field at normal full-load current at about one-third speed, and then speeding up the machine at a rate that will trip the overspeed device in one minute or less. When the machine has been conditioned to go into service, it must be connected in parallel with the other generators in the plant, but before doing this it must be synchronized.

When synchronizing a generator for the first time, check all phases. After that, check only the phase used by the synchroscope, unless changes such as rewinding are made. Checking the phases may be done with: (1) *lamps*, (2) *polyphase-induction motor* or (3) *lamps and an inductance*. Each requires about the same time and work.

*Lamp Method:* Requires four transformers of the same ratio and voltage, preferably of the same size and design. On the high voltage side they should be good for generator voltage and, on the other, match that of the lamps. First, test the transformers by connecting them, as in Fig. 3. If the transformers all have the same polarity, voltage between any two of the leads, A, B, C and D, will be zero. When this condition exists, as it should, connect the transformers to the generator switch, as in method A, Fig. 4. See that the disconnect switches are open and the generator not running. Two lamps are connected in series in the circuit of each pair of transformer secondaries, connected in series.

Select lamps good for the secondary voltage of one transformer. Place one lamp near the synchroscope lamps for final check when synchronizing the gen-

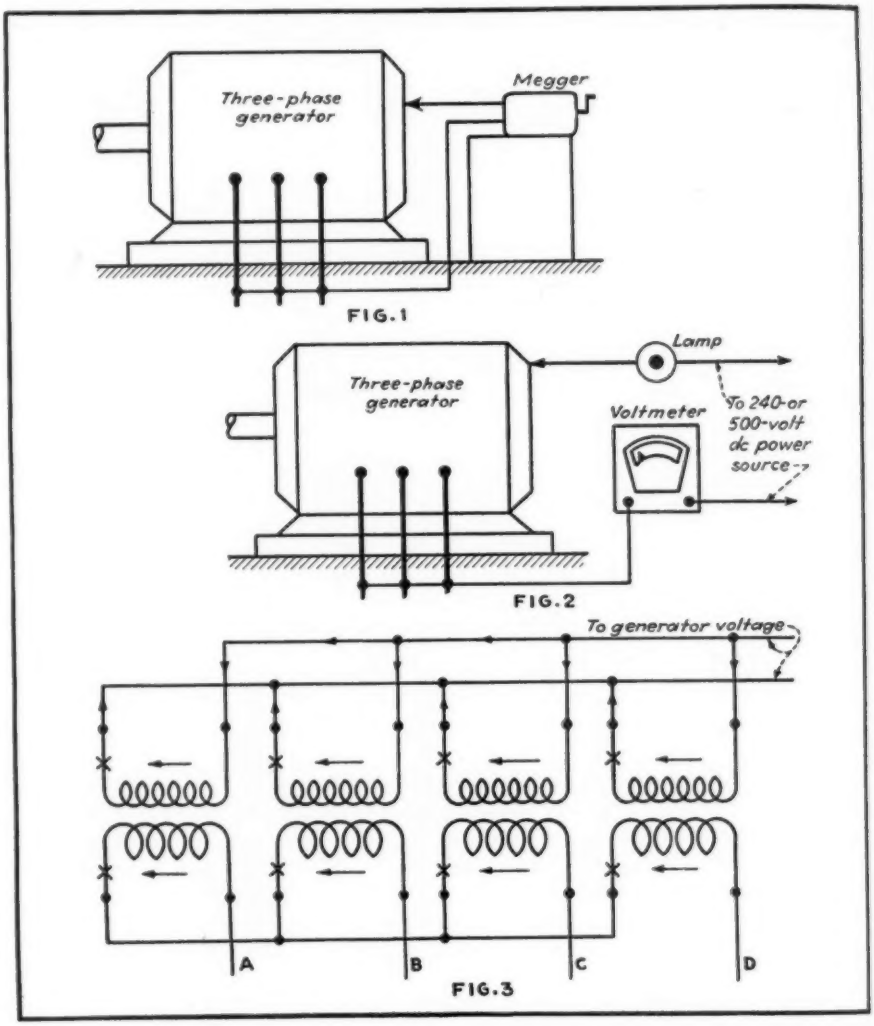



**Fig. 1—Megger test of generator-stator-winding insulation resistance. Fig 2—Voltmeter test of generator-stator-winding insulation resistance. Fig. 3—Connections for testing the polarity of four potential transformers to check phase rotation of generator**

erator with the other machines. After the connections are made and the disconnects closed, bring the generator up to speed and voltage, as is done with any generator to be synchronized. On the test transformers, the lamps change from bright to dark, changing more slowly as the unit gets nearer into synchronism. If all the lamps get bright or dark at the same time, the generator connections are correct. If pairs of lamps get bright, then dark, alternately, the generator connections are not correct and must be changed.

After stopping the generator and opening disconnects, interchange any two of the three generator leads at a convenient place between the generator and the first instrument transformer. When the generator is brought up to speed again with the disconnects closed, all lamps should get bright or dark together.

When this occurs, close the synchronizer switch to energize the synchroscope and its lamps. These lamps and the test lamps should get bright or dark together. As the lamps get dim, the synchroscope indicator should be approaching the *in-phase position*—that is, the mark at top of dial. Speed of the indicator is gaged by the time required to close the oil circuit breaker, which is closed just at the time or slightly before the synchroscope indicator reaches the mark at top. After running the generator a few minutes in parallel with the system, open the oil switch, shut down the generator, open the disconnects, and disconnect the phase-testing transformers. Unit is now ready to be put on the system and loaded.

*Polyphase-induction motor method:* When phasing-out is done with a motor, its voltage must equal that of the generator, or transformers must be provided to reduce generator voltage to that of the motor or less. Connections for making the test with the motor are shown in method B, Fig. 4, with a starter for the motor. This assumes that the transformer voltage is the same as that of the motor. If transformer voltage is one half, for instance, 220-v for a 440-v motor, then the starter may be omitted and a knife switch used to start the motor.

Connections are made to the motor for initial synchronizing with the disconnects open and the generator stopped. Disconnect all the generator leads at machine terminals and temporarily insulate them, by space or otherwise. The disconnects are then closed, the motor started and its direction of rotation marked. The indicator of the synchroscope is then moved by hand away from the in-phase mark by about 90 deg, the oil circuit breaker and the synchronizing switch being closed. This check of the synchroscope should bring the indicator back to the in-phase mark, with the lamps out, as the generator and bus transformers are energized by the same potential. If this does not result, the synchronizing connections to the generator are wrong and must be corrected.

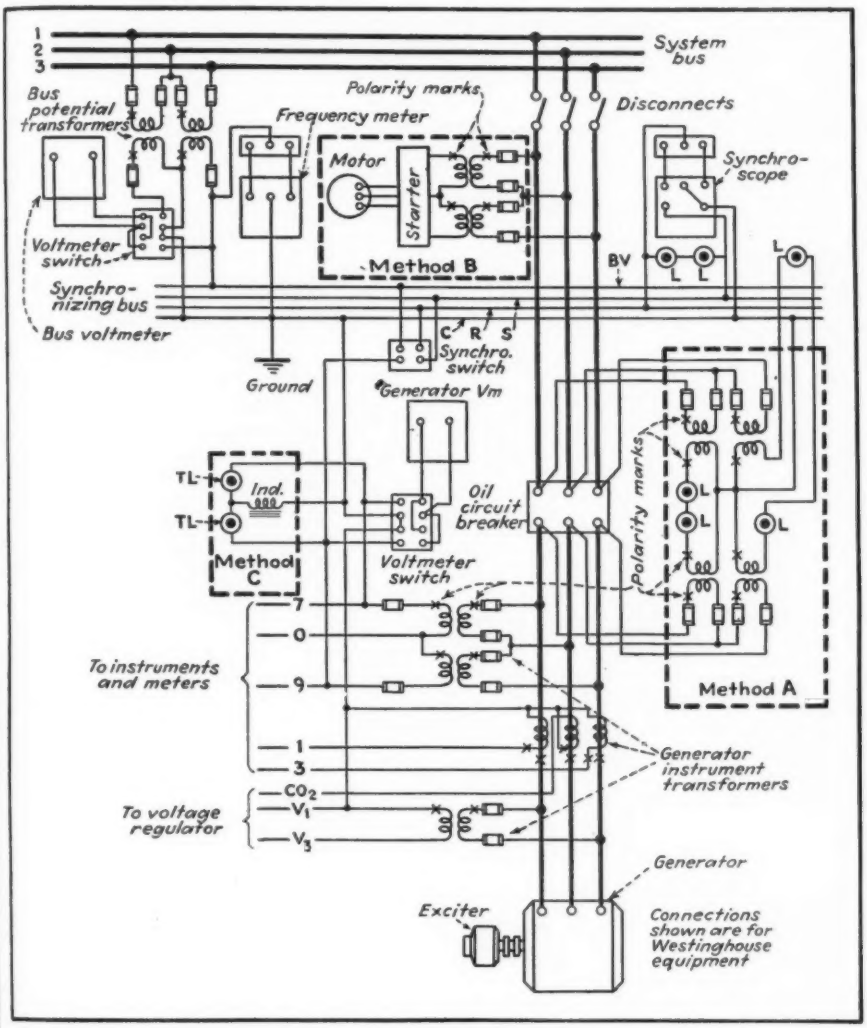



**Fig. 4—Connections for making in-phase test of new generator prior to synchronizing it with the rest of the system, by using lamps, a polyphase induction motor or a resistance and inductance, each requiring about the same time to do the work**

### *Phase-Rotation Test*

After the synchroscope is corrected, the generator leads are reconnected, with the oil circuit breaker and disconnects open. Bring the generator up to speed and voltage with the disconnects open. Close the oil circuit breaker and start the motor. If the motor rotates the same as in the first test, the generator will parallel with the system. If rotation reverses then any two of the generator leads must be interchanged between the generator and the first instrument transformers. Bring the generator up to speed as before and try the motor; this time its rotation should be the same as when started from the bus. When the motor rotation is correct, stop the generator and disconnect the test motor. The generator is now ready to be put on the system and loaded.

*Lamps-and-Inductance Method:* This method requires two lamps of about ten watts each and an inductance, such as the coil in a voltage relay that does not use a resistance in series. Connect the lamps and inductance as in method C, Fig. 4. One of the lamps will be noticeably brighter than the other when they are energized. If the lamp leads connected to 7 and 9 are interchanged, lamp brightness also interchanges.

For the initial synchronizing, disconnect and insulate the generator leads at the machine terminals. The disconnects and oil circuit breaker are then closed

(*Continued on page* 142)

# Portable Diesel-Electric Plants Follow Th

***Putting 600 kw into a 51-ton package that can be picked up and put down without auxiliary equipment takes ingenuity. T F Perkinson, General Electric, tells how it's done***

► PROBABLY the largest single-unit portable diesel-electric power plants yet built, two 600-kw units recently furnished the U. S. Navy Bureau of Yards and Docks by General Electric Co, combine standard equipment in an unusual design to give a compact package weighing 102,000 lb fully fueled and ready for service. Intended primarily for emergency power supply, the units embody special construction features providing the high degree of mobility needed to move them by trailer or rail and with or without auxiliary handling facilities.

The main power unit consists of a 900-hp V-type diesel, a direct-connected 600-kw alternator and metal-clad switchgear. Main engine, alternator and exciter mount directly on the plant base to keep down over-all weight; no subbase is used. To shorten unit length, one bearing takes care of the alternator-exciter set, with the alternator shaft close-coupled to the engine flywheel through a flexible coupling. This arrangement necessitates a relatively deep base structure; it is fabricated of 18-in. rolled channels to secure the stiffness needed to limit angular deflections between the diesel engine and the generator set.

A 3-point support system minimizes base distortion and consequent shaft misalignment that might result from lifting operations or lack of alignment in temporary foundation or cribbing. The base mounts on two supporting cross beams, one rigidly fixed to the base, the other connected at only one point. Pictures and captions on the opposite page show how lifting gear attaches to cross beams and one of several possible foundations.

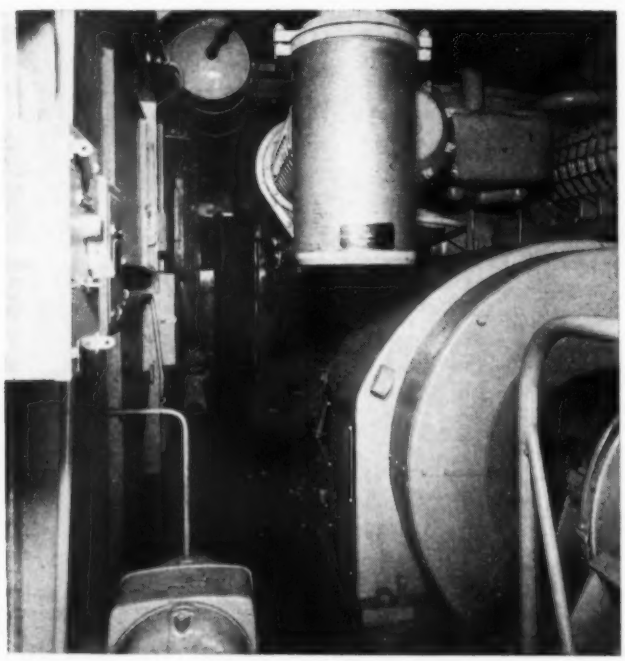
### *Superstructure Design*

The superstructure, an all-welded sheet-steel-and-angle assembly, serves an equipment housing function primarily. Large removable hatches and smaller hinged hatches in the roof provide access to the main engine-alternator set for inspection and maintenance of cylinder heads, liners, etc. Smaller roof hatches and hinged side panels insure ample ventilation for the plant during the periods that it is operated.

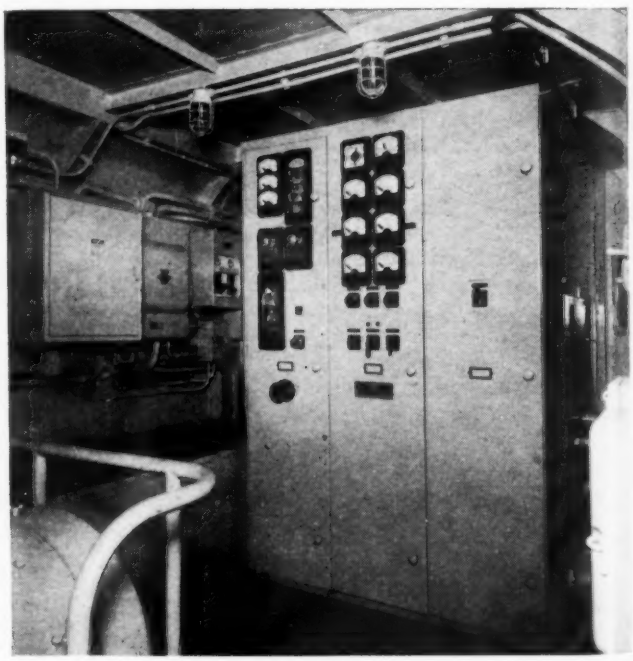
Removable bolted-on panels in the end of the structure give access to the rear of the metal-clad switchgear. A hinged door in one of the panels opens into the compartment in which the outgoing power cable connects to the plant bus. This cable, a detachable 3-conductor 150-ft length of the type employed for power supply to portable shovels, winds on a reel mounted in a bearing on the gooseneck of the trailer frame.

Located in the plant base, directly under and on either side of the main engine, a 900-gal fuel-oil tank provides storage capacity to run the plant at continuous rating for approximately 18 hr. A 50-gpm 110-v motor-driven pump transfers fuel oil from tank cars, trucks or other source of supply to the tank in the base of the unit.

These units may be used as independent power plants or they may be employed in conjunction with portable transformer substations, one of which is being furnished with each portable diesel-electric power plant.



**View from control station shows 600-kw generator with 900-hp 12-cyl V-type diesel engine in background**



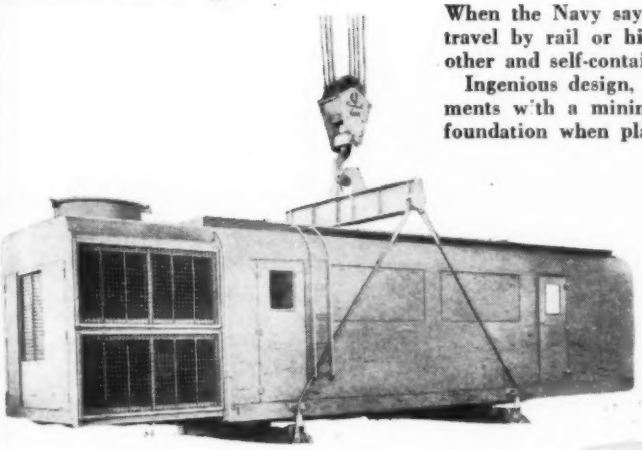
**Control for the 600-kw engine-generator plant centers in these three metal-clad dead-front switchgear panels**

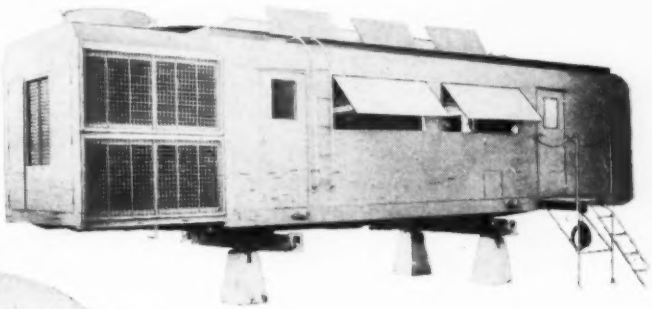
# ow the Navy

## HERE'S HOW A PLANT GOES INTO ACTION

**When the Navy says *portable* power plant this is what it means: (1) one that can travel by rail or highway, (2) one that can be loaded or unloaded by crane or by other and self-contained means when a crane isn't handy.**

**Ingenious design, illustrated in these pictures and captions, meets all these requirements with a minimum of special equipment. Provision is made for a three-point foundation when plant is on the job.**

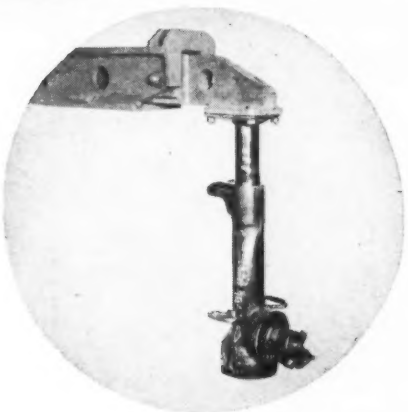




**Transportation:** For rail shipment, over-all dimensions meet clearance restrictions for mounting on standard-gage flat cars.

For highway shipment, a 50-ton carry-all serves both plants, and Navy specifications require that this trailer be suitable for carrying loads other than the portable units. This means provision for easy loading and unloading, with or without crane facilities.

**Handling by crane:** Special lifting rig shown above permits use of single crane hook and applies lifting strains to proper points on base to avoid twisting or warping leading to misalignment of engine-alternator set.



**Handling without crane:** Inverted screw jacks, shown in circle, bolt to extensible jacking pads built into ends of cross beams. For loading, jacks lift plant off base cribbing or other operating foundation, which is removed so trailer can roll into position beneath plant and between jacks. In transit, jacks are carried in a locker on the trailer gooseneck and jacking pads are withdrawn and locked into position within base beams. Special clamps secure plant to trailer platform.

**On the job:** Plant may rest on three-point foundation of fabricated pedestals, as shown above, or on locally available cribbing. Special frame design minimizes possibility of base distortion.

## HIGHLIGHTS OF MOBILE-PLANT SPECIFICATIONS

**Main unit:** 2-cycle 12-cyl 720-rpm V-type General Motors diesel, rated at 900 bhp continuously and capable of delivering 1125 bhp for two hours, driving a 2300-v 3-phase 60-cycle 750-kva 0.8 of alternator with direct-connected 75-kw 125-v dc exciter.

**Switchgear:** Three-unit metal-clad dead-front switchgear with a 50,000-kva-rupturing-capacity oil circuit breaker for alternator-exciter control. Both Thyrite and capacitor lightning arresters are mounted inside the cubicles.

**Engine cooling:** A 45-in. high-efficiency propeller fan, belt-driven from the main engine, draws air through two banks of finned-tube radiators, elements of which stand at either side of a compartment at one end of the housing. Jacket water from each bank of engine cylinders flows to the radiator on the corresponding side of the plant. Cooled water from both radiator groups mixes in a tank at the accessory end of the engine before return to the jackets. Radiators are not louvered but design permits adding louvers if desirable. Manipulation of air bypass louvers and doors in the end of the radiator compartment controls cooling-water temperature.

**Silencing:** Dry locomotive-type exhaust mufflers mount on top of the engine directly under roof openings.

**Station-service power:** Three sources supply 110-v 60-cycle single-phase power: (1) a 10-kva air-cooled transformer mounted within the metal-clad switchgear operates when the main engine is running, (2) a self-contained 5-kw diesel-driven single-phase alternator supplies service power when main engine is not running and when plant is remote from an external source of 110-v energy, (3) if plant operates near a permanent source of 110-v supply for long periods, as when idle or in storage, an external plug-in system can be used to furnish energy for battery charging, plant lighting, space heaters in both metal-clad compartments and in the main alternator, and for other services.

**Battery:** A 32-cell, nominally 64-v, lead-acid battery operating at full voltage through a 2-step starting control cranks the main engine. A 16-v tap provides for starting the 5-kw auxiliary set.

**Compressed air:** A small 12-cfm 110-v motor-driven compressor with an air-storage tank is provided for cleaning and maintenance.

# Larger Sheaves Increase V-Belt Capacity for War

***Outline of a sound plan for industry to make a substantial contribution to America's rubber pile in the years ahead. Besides reducing the amount of rubber in V-belt drives, the changes are designed to increase belt life and decrease cost***

▶ A NEW PLAN to save 250,000 lb of crude rubber this year—the amount that 25,000 trees produce yearly—has been announced by Walter Geist, president of Allis-Chalmers Mfg Co and inventor of the multiple V-belt drive. The program calls for "wartime drives" using shorter center distances and larger sheaves on all new applications to be made in 1943. "The plan is geared to present design limitations," said Mr Geist, "and only slight changes in dimensions are necessary to save a quarter-million pounds of crude rubber."

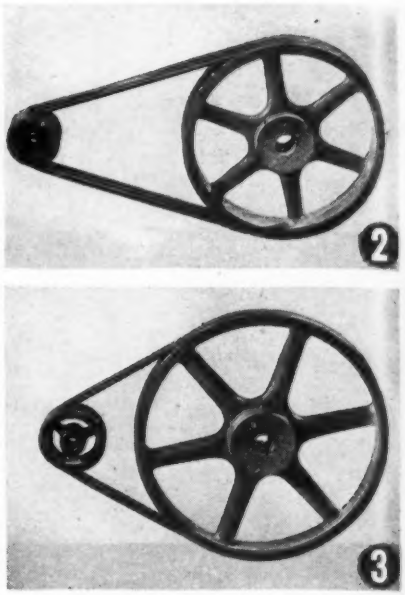



**Fig. 2—A V-belt drive with 3-in. and 12-in. sheaves requires three A-section belts for a 2-hp 1750-rpm motor. Fig. 3—Increasing the sheave diameters, Fig. 1, for the drive permits reducing the number of belts from three to two**

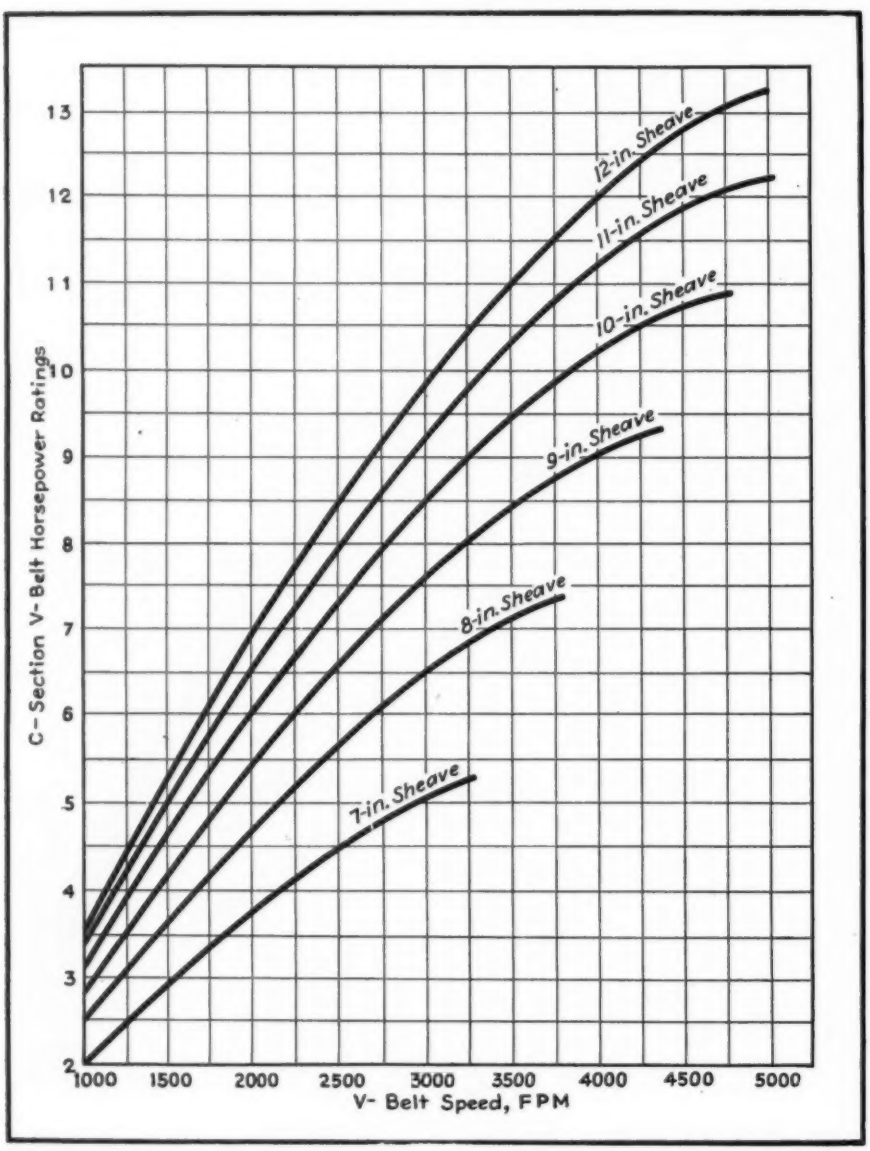



**Fig. 1—Higher belt speeds multiply horsepower ratings of V-belts two to three times and permit use of fewer belts for a given drive. Ratings given are for standard C-section V-belts. Note how belt capacity increases with speed and sheave size**

"Although engineering of individual V-belt drives has been governed in the past largely by such considerations as convenience, habit and machine design, today the most important consideration is the saving of rubber for our dwindling stockpile," Mr Geist pointed out. "However," he added, "the plan should not be regarded as a temporary, wartime expedient, for the increases are sound and practical—in line with a long-range trend to larger diameters."

### *Scope of Program*

By following the program, nearly every field of industry would actually contribute hundreds of pounds of rubber to the war effort. In addition, the buyers of new V-belt drives could, according to the plan, save on the average expenditure $15 out of every $100 for new drives and $35 out of every $100 for replacements.

The possibilities of increased size of sheaves and higher V-belt speeds are indicated in the photos and curves. These curves, Fig. 1, are for a standard C-cross-section V-belt. This type, at a speed of 2000 fpm on a sheave with a 7-in. pitch diameter, has a rating of 3.7 hp. At the same speed on a 12-in. sheave, this belt has a rating of nearly 7 hp. In other words, by increasing

(*Continued on page* 144)

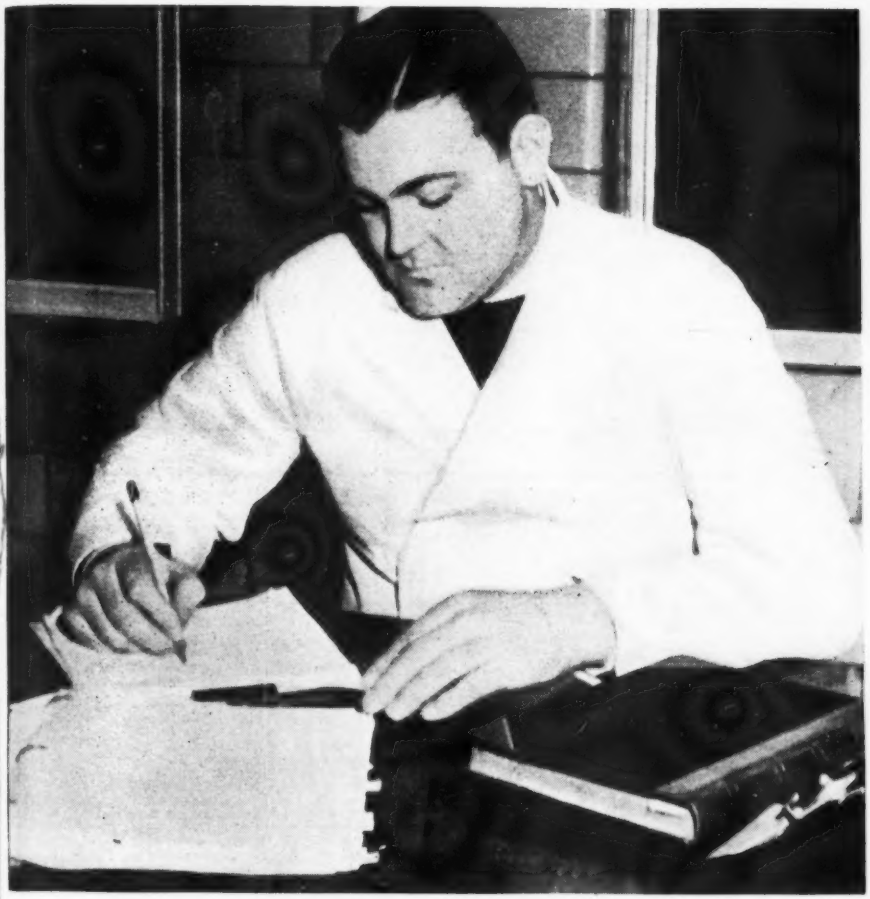
# Scheduled Lubrication Keeps Bearings Rolling Along

***Timely experiments point the way to reduction of lubrication costs and increased reliability of production machinery by providing a system that insures proper oiling of all equipment bearings***

By A J STROHMAIER
*Lubrication Engineer*
*Joseph E Seagram & Sons*

AND

C L LOVELL
*Professor of Chemical Engineering*
*Purdue University*



**Guided by the schedule, Fig. 6, the lubrication foreman allocates the oilers' monthly work, thus insuring proper attention for the bearings of all equipment**

▶ CONSERVATION OF PRODUCTION machinery and its accessories is one of industry's major problems today as it becomes more and more difficult to buy new equipment. In the job of prolonging the life of existing machinery beyond "the duration," correct lubrication assumes a dominant position as the most important of the various mechanical phases of maintenance.

A system for scheduling and recording lubrication is outlined here for engineers engaged or interested in increasing machinery's efficiency and reliability by correct lubrication. The system has seen about two years of successful service in two of the largest plants of Joseph E Seagram and Sons, Inc, and about one year in their newest and most modern distillery in Louisville, Ky. During this time it has reduced to a noticeable degree equipment failures caused by faulty lubrication. In one plant a rough survey indicates a saving of approximately one-third in lubricants consumed per year. Although the system may have to be altered for different plant conditions, it seems reasonable to expect substantial savings in lubrication costs through reduction of waste and overlubrication.

In each Seagram plant, the lubrication department is supervised by a lubrication foreman who, in turn, is directly responsible to maintenance superintendent. Oilers are grouped throughout the five production departments: power, distillery proper, foods and feeds, warehousing and bottling.

**Instruction Book** Each departmental oiler or group of oilers is given a book that lists all equipment in each department. It is first typed and then reproduced in quantity. One sheet is shown in Fig. 1. Reading from left to right, it gives for each piece of equipment:

1. *Equipment number.*
2. *Equipment:* (a) name or type and (b) its parts or subassemblies requiring lubrication.
3. *Location* of equipment.
4. *Frequency* of lubrication. Abbreviations under this heading are: S—once per 8-hr shift, 2S—twice per 8-hr shift, D—once per 24-hr day, W—once per week, M—once per month, Y—once per year, 2Y—twice per year, and 4Y—four times per year.
5. *Lubricant* to be used on each part or subassembly. Standard specifications, which cover almost all lubricant requirements, have been set up for nine oils numbered from one to nine according to increasing viscosity, and for three greases numbered from one to three.
6. *Servicing instructions.*

**Report Forms** Each departmental oiler or group of oilers is given a set of daily, weekly and monthly report forms, which correlate all work to be done on equipment and which indicate whether parts require attention from four times per shift to once per day, from once to twice per week, and from once per month to once per year, respectively. They are also reproduced in quantity. Both sides of the sheet are to be used for the duration. There are an ample number of blank spaces to take care of changes in equipment and methods.

**Daily and Weekly Report Forms** These two forms are exactly alike. Weekly work, Fig. 4, is entered on a

separate form from work scheduled more frequently, Fig. 3, because of difficulties usually encountered in predicting and scheduling shutdowns for weekly oil changes. Daily and shift work, however, may be scheduled in the chronological order in which it is to be carried out, or it may be merely correlated into four times per work shift, etc, for each 8-hour shift, letting the oilers work out their own routine to suit their time best.

Included in Fig. 3 and 4 are headings for equipment numbers, name of equipment and its parts or subassemblies requiring lubrication, location of equipment, page reference to instruction book, frequency of lubrication and 14 headings, one for each day of two weeks. These schedules, properly checkmarked on each day and shift for work performed, and signed at the bottom by the oilers, are collected every two weeks and kept on file for at least three months.

**Monthly Report Form** This form, Fig. 5, correlates all work on equipment that requires attention from once per month to once per year. The monthly chart is exactly like the weekly except that the 14 daily columns are replaced by 12 monthly ones. The oiler receives a form at the beginning of each month, with a checkmark placed on the right-hand side of the sheet by the lubrication foreman opposite every piece of equipment to be serviced during the next thirty days. As the oiler completes the work of servicing a piece of equipment, he initials the proper square under the proper monthly heading until all checkmarks are satisfied.

**Recording Monthly Work** Schedules shown in Fig. 5 may be merely noted and filed at the end of the month, but to keep a complete record of monthly lubrication work, the oilers' initials are copied each month on a form identical with the oiler's monthly form. This so-called master report, Fig. 6, serves as a quick and ready reference in case a question arises as to how, when or by whom the equipment was lubricated.

**Work-Distribution Schedule** The lubrication foreman allocates the work every month by checkmarking the monthly schedules along the right-hand edge of the form, Fig. 5. When doing this, he is guided by the schedule shown in Fig. 2 which distributes the work from month to month as evenly as the limits of scheduling, vacation periods and rush production allow. Thus, the work-distribution schedule designates the particular 30-day period during which all monthly, four-times-per-year, or twice-per-year work is to be check-marked on the monthly schedule by the foreman for service by the oilers.

A lubrication scheduling system such as the one outlined reduces guess-work, forgetfulness and neglect to a minimum. Plant and maintenance engineers especially appreciate having a complete record at their disposal for ready reference. It makes possible planning lubrication months in ad-

JOSEPH E. SEAGRAM & SONS, INC.
LOUISVILLE, KENTUCKY

LUBRICATION INSTRUCTIONS

DEPARTMENT Power

PAGE NO. 1

| EQUIP. NO. | EQUIPMENT | LOCATION | FREQ. | LUBRICANT | SERVICING INSTRUCTIONS |
|---|---|---|---|---|---|
| 2297 | Worthington Pumps | Basement | | | |
| 2299 | Bearings | | D | Grease #2 | Grease Sparingly. |
| | Couplings (Poole) | | M | Oil #9 | Check, Add Oil. |
| | " " | | 4Y | Oil #9 | Drain, Flush, Refill. |
| 2298 | Elliot Turbines | | | | |
| 2300 | Bearings | | S | Oil #4 | Check. Drain Water & Add Oil when |
| | " | | M | Oil #4 | Drain, Flush, Refill needed |
| | Governor Arm | | S | Oil #3 | Check, Add Oil to Wick Feed Oiler when needed |
| 0017 | Back-Wash Pump | " | | | |
| | Packing Gland | | W | Grease #3 | Grease Sparingly. |
| | Bearings | | W | Oil #3 | Check, Add Oil when needed |
| | " | | 4Y | Oil #3 | Drain, Flush, Refill. |
| 0018 | Motor | | 2Y | Grease #2 | Grease Sparingly (Elec. M. Oiler) only |
| 0058 | Atrita Pulverizers | 1st Floor | | | |
| 0061 | Bearings (oil) | | S | Oil #6 | Check, Add Oil when needed |
| | " | | 4Y | Oil #6 | Drain, Flush, Refill. |
| | Coal "Knife" Bearing | | S | Oil #3 | Oil. Clean Excess |
| | Coal "Table" Bearing | | S | Grease #1 | Grease. Clean Excess |
| | Belt Idler Bearing | | W | Grease #2 | Grease Sparingly. |
| | By Pass Valve | | W | Grease #1 | Grease. |
| | Gear Case | | W | Oil #6 | Check, Add Oil when needed |
| | " | | 2Y | Oil #6 | Drain, Flush, Refill. |
| 0059 | Elliot Speed Reducers | | S | Oil #6 | Check, Add Oil when needed. |
| 0062 | Coupling (Poole) | | 2Y | Oil #6 | Drain, Flush, Refill |
| | " | | M | Oil #9 | Check, Add Oil when needed. |
| 0060 | Elliot Steam Turbines | | 2Y | Oil #9 | Drain, Flush, Refill |
| 0063 | Bearings | | S | Oil #4 | Check, Drain Water & Add Oil when |
| | " | | W | Oil #4 | Drain, Flush, Refill. needed |
| | Governor Arm (Oiled Bearings) | | S | Oil #3 | Oil Sparingly. |
| | " " (Greased " ) | | W | Grease #1 | Grease Sparingly. |

**Fig. 1—A page from the lubrication instruction book supplied to each departmental oiler or group of oilers that lists all equipment in each department**

JOSEPH E. SEAGRAM & SONS, INC.
LOUISVILLE, KENTUCKY

OILERS' DAILY REPORT
7 - 3 SHIFT

DEPARTMENT Power WEEK ENDING

| EQUIP. NO. | EQUIPMENT | LOCATION | INST. PAGE | FREQ. | M | T | W | T | F | S | S | M | T | W | T | F | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2297 | Worthington Pump Bearings | Basement | 1 | D | | | | | | | | | | | | | | |
| 2298 | Elliot Turbine Bearings | | | S | | | | | | | | | | | | | | |
| | " " Governor Bgs | | | S | | | | | | | | | | | | | | |
| 2299 | Worthington Pump Bearings | Basement | 1 | D | | | | | | | | | | | | | | |
| 2300 | Elliot Turbine Bearings | | | S | | | | | | | | | | | | | | |
| | " " Governor Bgs | | | S | | | | | | | | | | | | | | |
| 0063 | Elliot Turbine Bearings | | | S | | | | | | | | | | | | | | |
| | " " Governor Bgs | | | S | | | | | | | | | | | | | | |

OILERS' INITIALS

**Fig. 3—Daily-report forms schedule all daily and shift work listed in the lubrication instruction book, Fig. 1**

JOSEPH E. SEAGRAM & SONS, INC.
LOUISVILLE, KY.

OILERS' WEEKLY REPORT
7 - 3 SHIFT

DEPARTMENT Power WEEK ENDING

| EQUIP. NO. | EQUIPMENT | LOCATION | INST. PAGE | FREQ. | M | T | W | T | F | S | S | M | T | W | T | F | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0017 | Back-wash Pump Bearings | Basement | 1 | W | | | | | | | | | | | | | | |
| | " " " " | | | W | | | | | | | | | | | | | | |
| 0058 | Atrita Pulverizer | 1st.Fl. | 1 | | | | | | | | | | | | | | | |
| | Belt Idler Bearings | | | W | | | | | | | | | | | | | | |
| | By-Pass Valve | | | W | | | | | | | | | | | | | | |
| 0059 | Gear Case | | | W | | | | | | | | | | | | | | |
| 0060 | Elliot Turbine Governor Bgs | | | W | | | | | | | | | | | | | | |

OILERS' INITIALS

**Fig. 4—Weekly-report forms schedule all weekly work listed in the lubrication instruction book, Fig. 1**

vance. In case of equipment failures it often assists in ascertaining the cause, or in tracing neglect to its source. Oilers, too, are benefited by having their duties outlined to a minute degree. This is especially helpful during periods of "rotation" and to new and relief oilers. Of course when oilers initial and sign the schedules a certain dependence is placed on their honor, but an occasional checkup by their foreman usually suffices to keep them on the "straight and narrow."

**Ball-Bearing Electric Motors** Many plants experience considerable trouble because of overlubrication of grease-lubricated electric motors. To overcome this difficulty at the Seagram plants, these motors are listed on a separate work distribution schedule and separate monthly report forms. The motors are delegated to one oiler and strict instructions are given to the other men to refrain from servicing them. Random lubrication is discouraged by the added precaution of substituting ordinary pipe plugs for all grease fittings until the men become thoroughly convinced that these motors run better and longer without their "motherly" attention.

Placing his initials on the electric motor schedule is a "short-hand" notation to designate the type of service that the oiler has given each motor. For instance, John Doe signs his initials in the proper monthly columns as: *JD* in one column means bearings or housings were removed, cleaned and replenished with fresh grease by hand. *JD* in another column means grease drain plugs were removed and grease added while motors were running. *JD* in still another column means it was not possible to lubricate by the above methods; therefore motors received only a small addition of grease with no provision against possible excess except by certain relief fittings.

**Grease - Lubricated Bearings** Many maintenance engineers have undoubtedly had the experience of finding two or three different kinds of grease in one bearing. The idea still prevails among too many oilers that one grease is just as good as another. To overcome this, the number of greases per plant was cut down to a bare minimum. Then, different types of grease fittings, such as Alemite pin-type, Alemite hydraulic, and Alemite dot fittings, were installed for each grease requirement. Thus, all sleeve-type bearings requiring calcium-base cup grease were equipped with hydraulic Alemite fittings; all ball bearings requiring sodium-base grease were equipped with pin-type fittings, etc. Each group of oilers received one grease gun for each type of fitting with definite instructions as to the grease to use. No adapter fittings were supplied or permitted. Once set up, this system is automatic and has been successful.

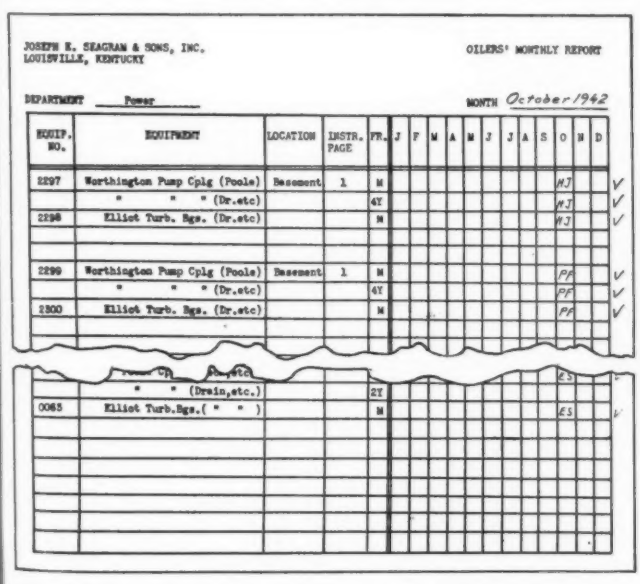
The authors wish to acknowledge the many helpful suggestions that R L Ennis and A W Kalkhoff offered during the period of preparation and installation of this system of lubrication.

JOSEPH E. SEAGRAM & SONS, INC.
LOUISVILLE, KENTUCKY

OILERS' WORK DISTRIBUTION SCHEDULE

| | | January | February | March | April | May | June | July | August | Sept | October | November | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillery Oilers | Power | M<br>4Y<br>2Y | M | M | M<br>4Y<br>Y | M | M | M<br>4Y<br>2Y | M | M | M<br>4Y | M | M |
| | Distillery | M | M<br>4Y<br>2Y | M | M | M<br>4Y<br>Y | M | M | M<br>4Y<br>2Y | M | M | M<br>4Y | M |
| | Foods & Feeds | M | M | M<br>4Y<br>2Y | M | M | M<br>4Y<br>Y | M | M | M<br>4Y<br>2Y | M | M | M<br>4Y |
| Warehouses | | M | M<br>2Y | M<br>4Y | M<br>Y | M | M<br>4Y | M | M<br>2Y | M<br>4Y | M | M | M<br>4Y |
| Bottling | | M<br>2Y | M | M<br>Y-1st fl. rollers pulleys | M<br>Y-2nd fl. & rollers pulleys | M<br>Y-4th fl. & rollers pulleys | M | M<br>2Y | M<br>Y-gears, reducers on Bott.l. | M<br>Y-all other gear reducers | M | M | M |

Fig. 2—Work-distribution schedule guides the lubrication foreman in allocating work in all departments of the plant at the beginning of each monthly period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LOUISVILLE, KENTUCKY

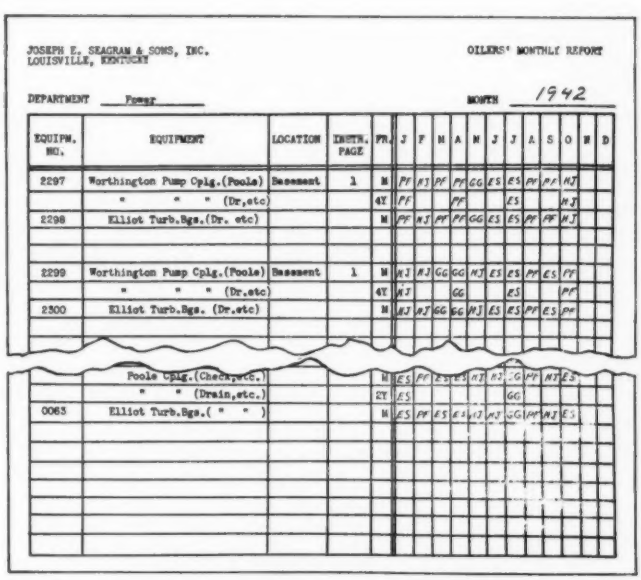
OILERS' MONTHLY REPORT

DEPARTMENT Power

MONTH October 1942

| EQUIP. NO. | EQUIPMENT | LOCATION | INSTR. PAGE | FR. | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2297 | Worthington Pump Cplg (Poole) | Basement | 1 | M | | | | | | | | | | MJ | | |
| | " " " (Dr.etc) | | | 4Y | | | | | | | | | | MJ | | |
| 2298 | Elliot Turb. Bgs. (Dr.etc) | | | M | | | | | | | | | | MJ | | |
| 2299 | Worthington Pump Cplg (Poole) | Basement | 1 | M | | | | | | | | | | PF | | |
| | " " " (Dr.etc) | | | 4Y | | | | | | | | | | PF | | |
| 2300 | Elliot Turb. Bgs. (Dr.etc) | | | M | | | | | | | | | | PF | | |
| | Power Cplg. (Poole) (Drain,etc.) | | | 2Y | | | | | | | | | | ES | | |
| | " " " (Drain,etc.) | | | 2Y | | | | | | | | | | | | |
| 0063 | Elliot Turb.Bgs.( " " ) | | | M | | | | | | | | | | ES | | |

Fig. 5—Monthly report form schedules all once-per-month to once-per-year work listed in instruction book, Fig. 1


JOSEPH E. SEAGRAM & SONS, INC.
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OILERS' MONTHLY REPORT

DEPARTMENT Power

MONTH 1942

| EQUIPM. NO. | EQUIPMENT | LOCATION | INSTR. PAGE | FR. | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2297 | Worthington Pump Cplg.(Poole) | Basement | 1 | M | PF | MJ | PF | PF | GG | ES | ES | PF | PF | MJ | | |
| | " " " (Dr,etc) | | | 4Y | PF | | | PF | | | ES | | | MJ | | |
| 2298 | Elliot Turb.Bgs.(Dr. etc) | | | M | PF | MJ | PF | PF | GG | ES | ES | PF | PF | MJ | | |
| 2299 | Worthington Pump Cplg.(Poole) | Basement | 1 | M | MJ | MJ | GG | GG | MJ | ES | ES | PF | ES | PF | | |
| | " " " (Dr.etc) | | | 4Y | MJ | | | GG | | | ES | | | PF | | |
| 2300 | Elliot Turb.Bgs. (Dr.etc) | | | M | MJ | MJ | GG | GG | MJ | ES | ES | PF | ES | PF | | |
| | Poole Cplg.(Check,etc.) | | | M | ES | PF | ES | ES | MJ | MJ | GG | PF | MJ | ES | | |
| | " " (Drain,etc.) | | | 2Y | ES | | | | | | GG | | | | | |
| 0063 | Elliot Turb.Bgs.( " " ) | | | M | ES | PF | ES | ES | MJ | MJ | GG | PF | MJ | ES | | |

Fig. 6—On the master report form all oilers' initials are copied from their monthly reports each month of the year

# Adequate Fuel-Oil Storage Is Good Diesel-Plant Insurance

***Cheap compared to other plant costs, ample storage protects against interruptions caused by fuel-supply failure. Glenn C Boyer, Burns & McDonnell Engrg Co, shows how to figure capacity needed and how to construct storage facilities***

► IT'S NO TRICK to provide adequate fuel-oil storage for it is one of the cheapest items of diesel-plant cost. Likewise, it is well to err on the side of too much rather than too little, not alone because such storage is cheap, but because today plant operation may turn on whether fuel oil is at hand or tied up en route.

Under normal conditions, amount of storage capacity in any given case depends on several factors: (1) average quantity of oil needed each month, (2) method of oil transportation to the plant site, (3) plant location and distance from source of supply, and (4) method of buying and effect of price fluctuations. Let's look at these factors in the order given.

For estimating plant oil consumption, figure that 10 kwhr or 15 bhphr is produced for each gal of fuel oil consumed. While virtually any diesel engine in power service today does considerably better than the figures given, nevertheless, these values are convenient to remember, easy to apply and on the side of safety. To be even more conservative, figure the consumption for the month showing highest load. This is particularly important in plants where there is considerable seasonal load variation.

### *Methods of Fuel Delivery*

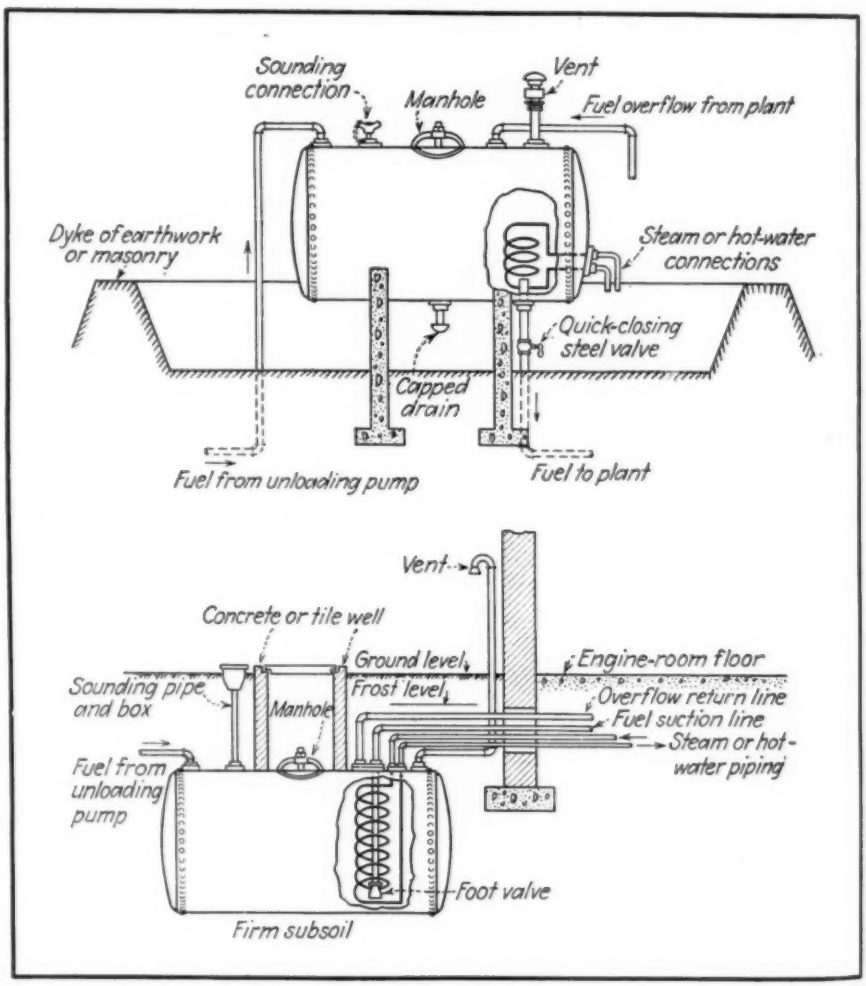
Available methods of fuel delivery include railroad tank car, tank wagon, barge and pipeline. The latter is available only when the diesel plant adjoins a pipeline delivery station or a refinery. Barge shipment can be used only at coastal or lake ports or river terminals where the amount of oil justifies delivery by this method.

For most plants, the delivery question boils down to tank-car or tank-wagon shipment. Larger plants, particularly on the outskirts of a town or in rural areas, usually have a railroad siding or are close enough to one to permit pumping direct from tank cars. For smaller plants, particularly in urban areas, tank-wagon delivery is convenient.

Standard tank cars vary in capacity from 6000 to 10,000 gal; tank wagons, from 600 to 4500 gal. As pointed out in DEMA's "Standard Practices," the minimum tank-wagon compartment is approximately 200 gal, and there is usually no price reduction for more than one compartment. Some tank-wagon suppliers offer a discount in fuel-oil prices for yearly contracts irrespective of frequency of delivery. On the other hand, the Petroleum Code does not permit tank-car quotations if cars are not unloaded directly into the buyer's storage facilities. Accordingly, there is no buying advantage in installing tank-car capacity if actual delivery is by tank wagon.

Plant location may limit facilities. In a congested business district, space is often lacking or may prove too expensive. In a residential district, aboveground tanks may prove unsightly.

Distance oil is transported also influences storage capacity needed, since enough must be on hand to operate even though deliveries are slowed up or cut off by strikes, transit delays or




**Typical horizontal fuel-oil tanks: Fig. 1 (top)—Above ground, Fig. 2—Below ground**

other causes. A diesel plant near a refinery need have no fears about fuel availability; on the other hand, when oil is shipped 500 to 1000 miles, a plant must always have sufficient storage to take care of interruptions and delays.

The smaller plant usually finds it most convenient to buy fuel under yearly contract, which may or may not specify price. In such a case, there is little incentive to provide storage space to take advantage of price fluctuations. However, larger plants frequently save substantial sums by filling storage tanks when the price is down.

In most cases, determining fuel-storage capacity begins with consumption rate and delivery method fixed by plant conditions. Next step involves frequency of delivery. In a plant supplied by rail, using about 8000 gal per month, this amounts to about a tank car each month. Or, consider a plant supplied by tank wagon, using about 1600 gal per month. A weekly schedule of about two 200-gal tank-wagon compartments probably is most convenient. In general, frequency of delivery is fixed to give the best price setup possible, along with reasonable convenience. In rare cases, when local conditions restrict fuel-storage capacity arbitrarily, frequency of delivery may be determined by storage capacity.

Minimum storage capacity is fixed in most cases by size of shipment; partly filled tanks must be large enough to take the contents of a full tank car or of one or more tank-wagon compartments. A good general rule for storage capacity is to provide enough to last over at least twice the normal period between shipments. This figure may be reduced slightly when: outside conditions restrict capacity, cost of storage facilities would be excessive, or frequent shipments can be guaranteed. In most cases, it pays to install more capacity, particularly when shipments come from a distance or it is desirable to take advantage of price fluctuations.

### *Storage-Tank Construction*

Bulk storage facilities may be installed above or below ground. Tanks above ground are usually steel constructed; buried tanks may be either steel or reinforced concrete. In either case, tank construction and piping should conform to regulations of the National Board of Fire Underwriters, as expressed in "Containers for Storing and Handling Flammable Liquids," NBFU Pamphlet No. 30. The American Petroleum Institute has issued standards covering vertical storage tanks—"API Specifications for Standard Tanks with Riveted Shells," Standard No. 12-A.

To facilitate occasional tank cleaning, it is advisable to divide total capacity between at least two tanks. This permits cleaning without interruption to plant operations. Fig. 1 and 2 show typical arrangements for steel tanks installed either above or below ground, as set forth in DEMA's "Standard Practices." Fig. 3 illustrates construction of a typical reinforced concrete tank of 25,000-gal capacity, for installation below ground. In designing reinforced-concrete tanks, care should be taken to see that no oil-soluble materials are used in expansion joints. It is advisable to coat the inside of a concrete tank with an oil-proofing compound or a water-glass solution.

## Capacity of Vertical Tanks (gallons)

| *Diameter, ft* | *Nominal height, ft* 12 | 17¾ | 23½ |
|---|---|---|---|
| 12 | 10,080 | 15,120 | 20,160 |
| 18 | 12,680 | 34,020 | 44,940 |
| 24 | 40,320 | 60,480 | 80,220 |
| 30 | 63,000 | 94,080 | 125,160 |
| 36 | 90,720 | 142,800 | 180,600 |

## Capacity of Horizontal Tanks (gallons)

| *Tank length, ft* | *Tank diameter, ft* 8 | 10 |
|---|---|---|
| 17 | ..... | 10,000 |
| 22 | ..... | 15,000 |
| 27 | 10,000 | 20,000 |
| 40 | 15,000 | ..... |

**A number of standard tank sizes have been established by the API; those in the table are the sizes most likely to be found in diesel practice. While there is no standard for horizontal fuel tanks, sizes given in the table are considered standard with most tank builders.**

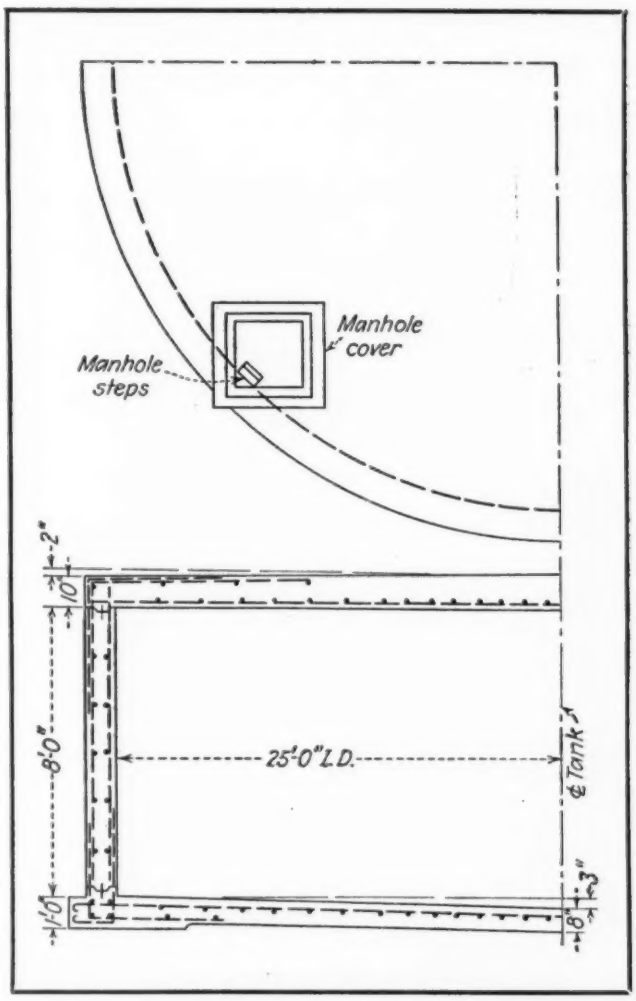



Fig. 3 (right)—Section shows construction of 25,000-gal reinforced-concrete underground tank. Plan shows manhole location

# Standby Boiler-Feed Pumps

***In this second article reviewing pump facts, Igor J Karassik, application engineer, Worthington Pump & Machinery Co*, discusses practical ways, with diagrammed directions, to make one spare pump stand by for two systems with safety***

► WITH NEW STATIONS getting along on minimum spare pump capacity and older ones carrying high loads for long periods on veteran pumps, plant operators are naturally on the lookout for pointers that increase reliability and effectiveness of spare boiler-feed pumps. No longer do designers provide adequate standby as a matter of course. Instead, as materials and manufacturing facilities for pumps are limited, the spotlight turns on operating methods that afford maximum safety with existing equipment.

Most plants operate more than one boiler-turbine unit. Many face the problem of providing spare pumps for two units of different operating pressures. Cross connections, where feasible, allow one spare pump to serve two boilers, or two header systems to serve several boilers. While it is obviously impossible to consider all existing variations in standby-pump arrangements and boiler-feed piping systems, a survey of the more common combinations offers ideas adaptable to other installations and other conditions.

### *Cross Connection*

A typical cross connection of pumps that serve two units in a single station is shown in Fig. 1. Duplicate piping and headers are omitted for simplicity. When the two generating units normally operate separately, each pump or group of pumps takes water from a separate direct-contact heater and supplies the boiler-feed header system of one group of boilers. With one pump operating on each system, as in Fig. 1, valves for each spare pump remain open with reverse flow prevented by check valves. All interconnecting valves are normally closed and the turbine-driven pump serves as spare for No. 1 boiler, while standby for No. 2 is provided by a motor-driven unit.

However, if conditions arise that require operation of both pumps on either boiler, or if any one pump is down for overhaul, one spare pump must stand by for both systems. Fig. 2 illustrates the operating condition of the turbine-driven pump supplying No. 2 boiler in emergency.

Use of a spare pump, whether turbine or motor driven, as emergency for an adjacent boiler-feed system, requires a different starting procedure from that followed when the standby pump always serves a specific boiler group. It must be considered that the two systems may not be operating under exactly the same conditions of service. One of the direct-contact heaters may be pegged at a pressure of, say, 5 psi gage, while the second heater may be fed with steam bled from some stage of

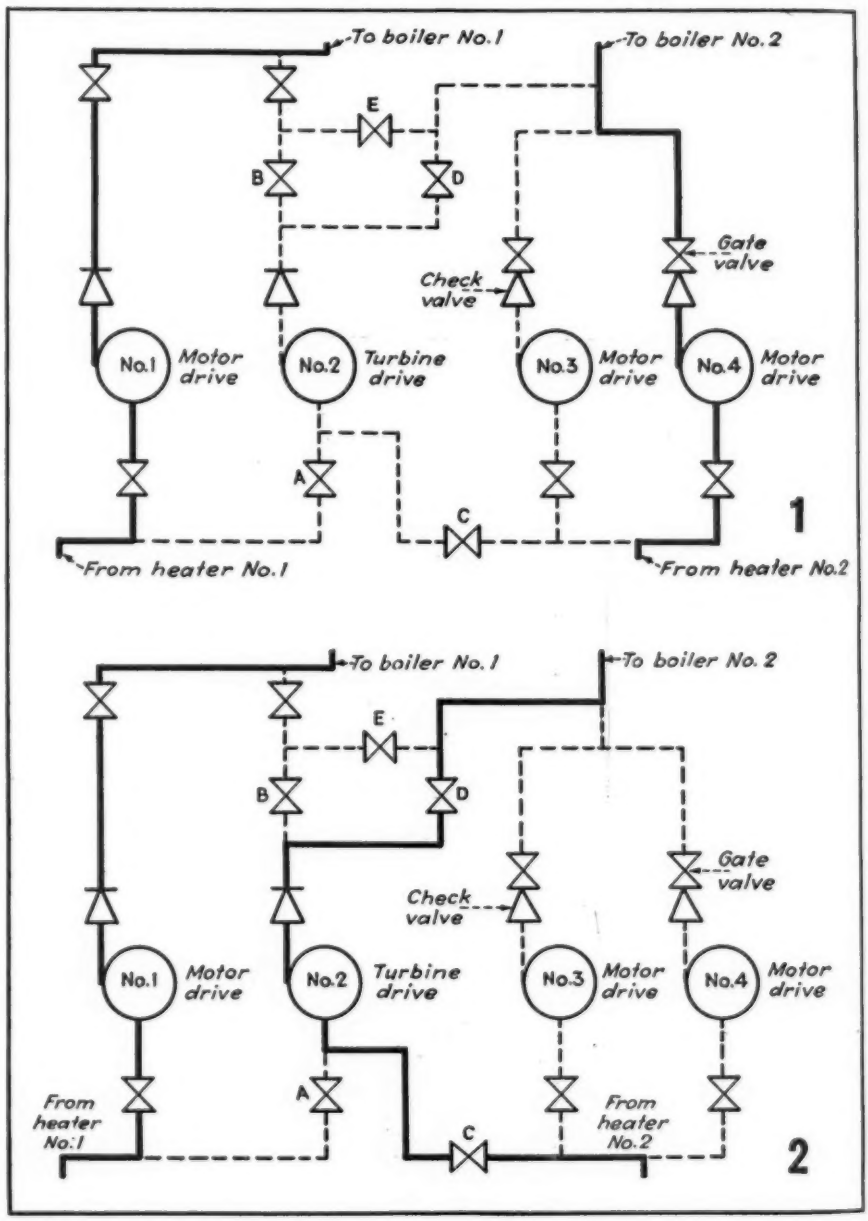



**Fig. 1—Typical schematic piping arrangement in a station with two separate boiler systems, each operating one boiler-feed pump with an available spare**

**Fig. 2—Arrangement for using turbine-driven spare pump to serve adjacent boilers when an emergency arises or one pump is out of service for overhaul**

* From a paper that won first prize in the "practical" class of the Hydraulic Institute contest. Republication rights reserved.

# Pinch-Hit in Emergencies

the main turbine, the pressure in this heater at full load reaching as high as 50 psi.

Even should the two systems be designed for exactly the same operating conditions, they will not always operate at the same load rating. Inasmuch as the pressures and temperatures in the direct contact heater will vary over the operating range, it is not permissible to interconnect the suction headers between the two heaters at any time. If both suction valves were to be opened simultaneously, flow would take place from the high- to the low-pressure side of the suction header with consequent flashing of feedwater into steam and complete interruption of service.

Likewise, to leave both discharge valves open could lead to serious operating difficulties. As a result, suction valves *A* and *C*, discharge valves *B* and *D* and interconnecting valve *E* all remain closed while No. 2 pump is on standby service. In emergency, valves *A* and *B* are opened to feed No. 1 boiler, or valves *C* and *D* to feed No. 2.

The interconnecting valve *E* allows pump No. 3 to supply No. 1 boiler in extreme emergencies, as in Fig. 3, provided all condensate flow can be diverted through No. 2 heater. Usually such operation is unsatisfactory and, if liable to occur frequently, additional interconnecting piping and valves should permit No. 3 pump to supply No. 1 boiler in the same manner as No. 2 pump operates on No. 1 boiler system.

In the operation of these valves it is highly important to remember never to start the standby feed pump until *both* suction and discharge valves have been opened. If the suction valve remains closed when the pump is started, the pumping action reduces pressure at the suction of the first stage below the vapor pressure that corresponds to the feedwater temperature. The pump then vapor-binds and can seize by running dry. If the discharge valve remains closed, the pump runs at shut-off condition with water temperature rising rapidly. If the standby pump is motor driven, open the valves before throwing the motor switch, and if turbine driven, manipulate the water valves before opening the turbine's steam admission valve to start the unit.

### *Check Feed Temperature*

Where the main generating equipment has been, on the whole, duplicated, boiler-feed pumps have nearly identical performance characteristics and no problem arises in using one of the pumps to serve either system. However, if suction and discharge pressures differ, or feed temperature varies, or pump capacities are greater for one unit than the other, the ability of one pump to serve another boiler-feed system should be checked.

For example, in Fig. 1, suppose that Unit No. 1 is designed for 500,000 lb per hr of 320-F feedwater: The pump operates from 105-psi gage suction to 1520-psi discharge. On the other hand, Unit No. 2, a later installation, requires 550,000 lb per hr of 240-F water and the pump operates between 41-psi suction and 1600-psi discharge pressure.

The turbine-driven feed pump, No. 2, meets the head and capacity requirements of Unit No. 1 at 3570 rpm. It must be speeded up to 3680 rpm to feed Unit No. 2, and requires 1510 hp instead of 1310. At the higher speed, op-

(*Continued on page* 146)

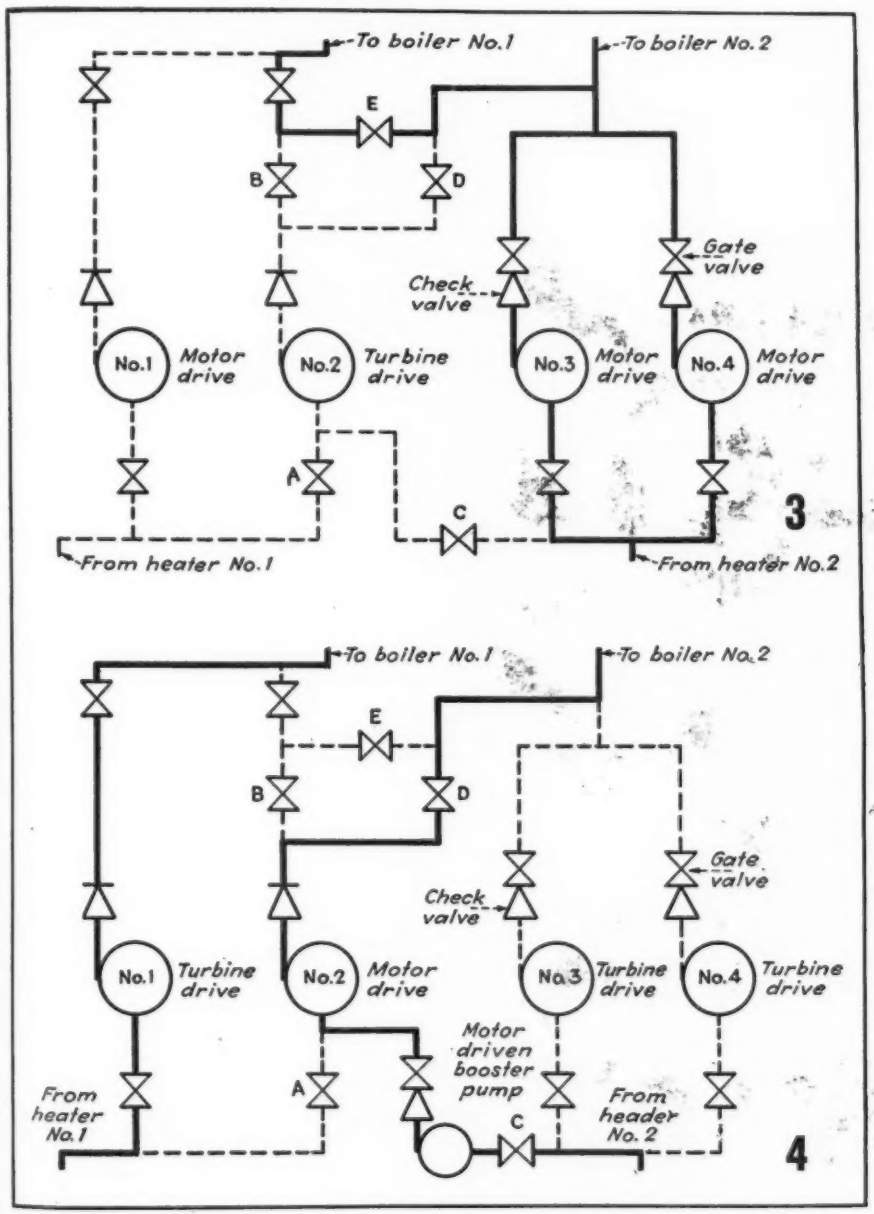



Fig. 3—For motor-driven pumps to supply two separate boiler systems in emergency operation, all condensate must be handled by one direct-contact heater

Fig. 4—Higher pressure for the adjacent system can be developed by a motor-driven booster pump in series with the lower-pressure spare pump

# Compressed Air In Colleges

***G K Saurwein, Harvard University, in a prize-winning paper*, tells how he uses compressed air to advantage in laboratories and libraries as well as for many jobs in the power plant***

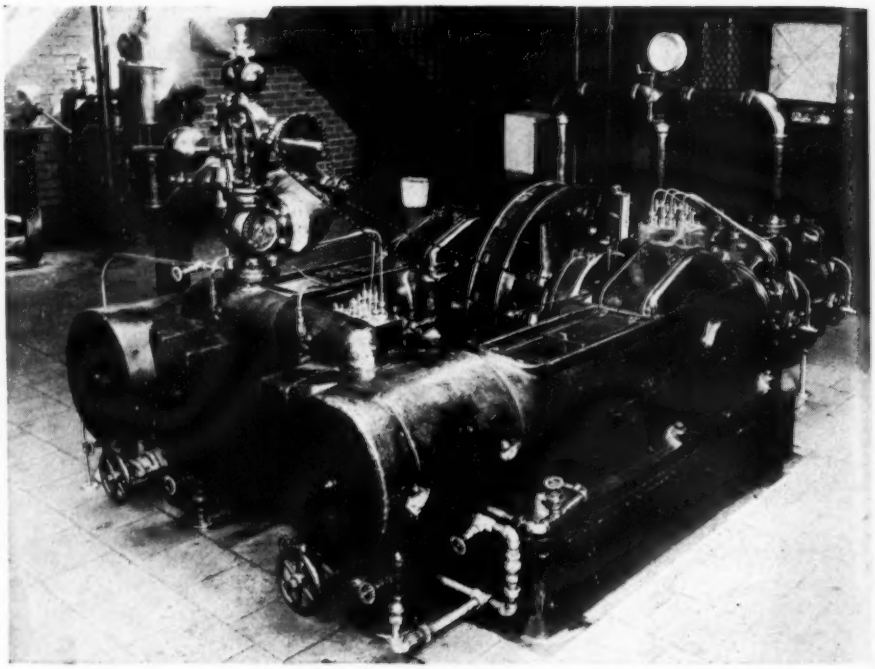


Fig. 1—Steam-driven duplex compressor furnishes exhaust steam for heating and supplies air to medical school and hospital for numerous laboratory purposes

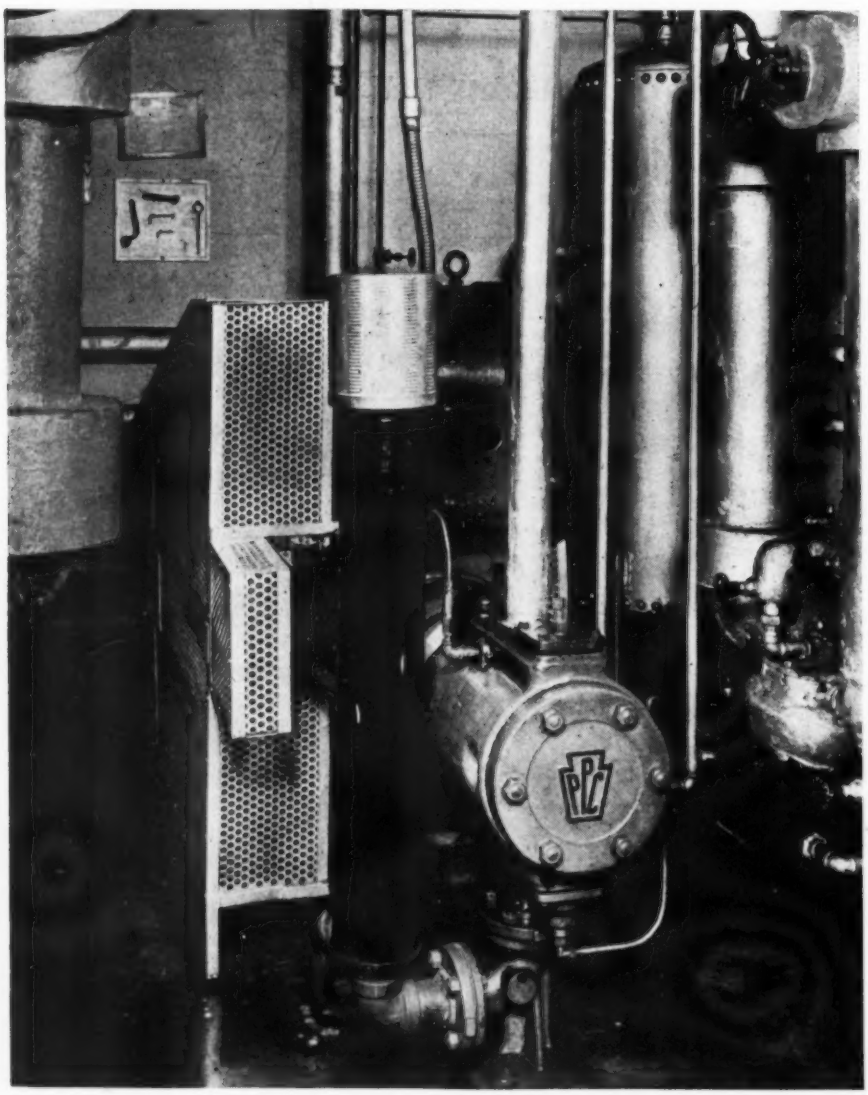


Fig. 2—One 200-cfm unit in the Biological Institute maintains north end pressure

► Compressed air can serve other institutions just as it now serves Harvard's many buildings, where steam-driven compressors, Fig. 1, exhausting into the heating system, supply low-cost compressed air. Auxiliary electrically-driven units connected to the system furnish standby service.

Power from compressed air drives machines that perform a multitude of tasks at Harvard. For example, air reaches all buildings through piping in tunnels and trenches to supply power that operates heating and ventilating controls, sewage ejectors and linotype machines. It cleans motors, sprays paint at the shop and fills dry-type sprinkler systems. In the chemical laboratories it is piped to all laboratory benches where it is used to blow glass, bubble through solutions for agitation, drive small stirring motors, displace liquids by air pressure in filling containers, operate muffle furnaces, dry by air blast and serve as cooling medium for the mercury-distilling condenser.

Air under pressure runs the assaying furnaces in the metallurgical laboratories, operates waste-paper bailing machines, and carries messages in the libraries through Lamson tubes where air is brought from service mains. At the Medical School a compressed-air turbine drives a super-centrifuge for analytical work in research.

At the power plant, air supplies

*Submitted in the "Compressed Air in Industry" contest sponsored by the Compressed Air Institute.

power for turbining the inside of boiler tubes; lancing slag and soot from the outside of tubes; supplying air blast for the shop forge; blowing dust out of generators, motors and other equipment.

Let's examine the details of the central distribution of compressed air that the University has adapted to such a variety of uses:

Tunnels usually interconnect individual buildings of an institution group to carry service piping and wiring from supply centers. With tunnels already installed it becomes a simple matter to run in a compressed-air line. The arrangement of the Harvard buildings required the installation of four compressors, located as follows:

At the south end of the system:

One 200-cfm steam-driven machine exhausting to the low-pressure steam main for the hot-water heating system of the Business School. This unit runs during the heating season and supplies practically all the air in winter.

One 200-cfm motor-driven unit operating when the steam-driven compressor is not in service. Both compressors feed into a 4x12 ft storage tank and are shown in Fig. 3.

At the midpoint of the system:

One 200-cfm vertical motor-driven machine at Smith Hall, connected to a 3x8 ft storage tank.

At the north end of the system:

One 200-cfm horizontal motor-driven machine complete with 30 in. by 8 ft storage tank, shown in Fig. 2.

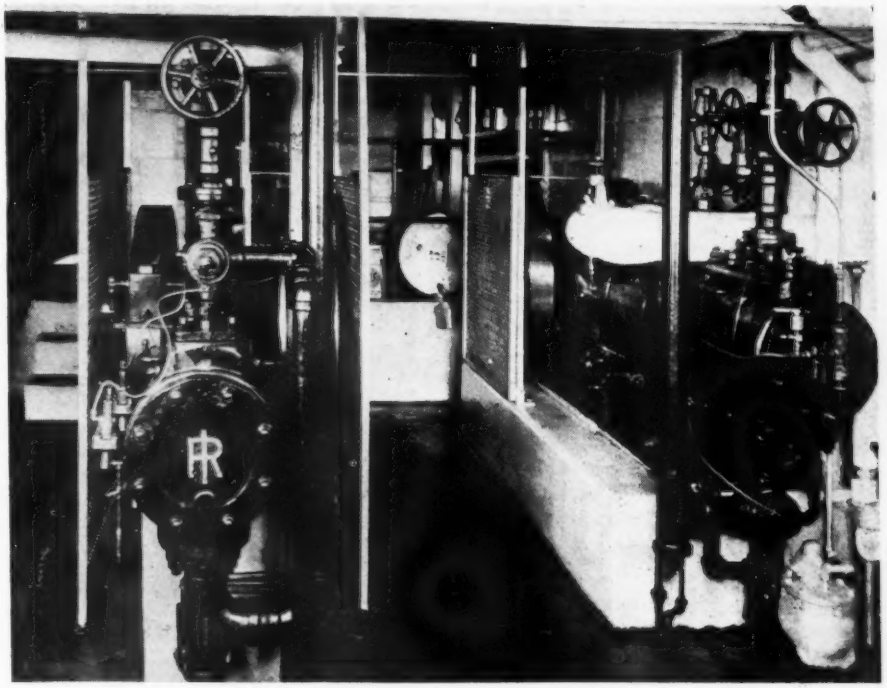


Fig. 3—Motor-driven and steam-driven compressors located in the Business School

The system air pressure varies between 50 and 60 psi. Normally the steam machine (south end) runs continuously during the heating season, exhausting into the heating mains, and the machine at the north end of the system, in the Biological Institute, cuts in for short periods to hold up the pressure at that point.

The deep sanitary lines in Kirkland House and those in the gymnasium drain into air ejectors. During the hours of heavy use of the sanitary facilities, the compressor in the Kirkland apparatus-room cuts in to hold pressure in that part of the system.

The tunnel air main is 2 in. throughout most of its length. Some runs are only 1¼ in. in diameter. Buildings using compressed air for the operation of heating and ventilating controls only have ¾- or 1-in. branch lines. Each building contains a storage tank about the size of an ordinary kitchen hot-water tank with blowoff cock. The service line from each tank contains a filter for removing moisture and oil; a regulating valve controls the pressure to that needed for operating the heating and ventilating control equipment (usually 15 psi).

On services requiring larger quantities of air, correspondingly larger storage tanks maintain the desired service pressure. Although the compressors are equipped with aftercoolers some moisture does appear in the storage tanks where excessive amounts are caught. Installation of galvanized piping keeps the system free of rust troubles.

Both the application and maintenance of compressed-air service for these many purposes are extremely simple. Air provides a strong and rugged method of transmitting power. The ordinary maintenance personnel, usually employed in such establishments can easily take care of the entire system.

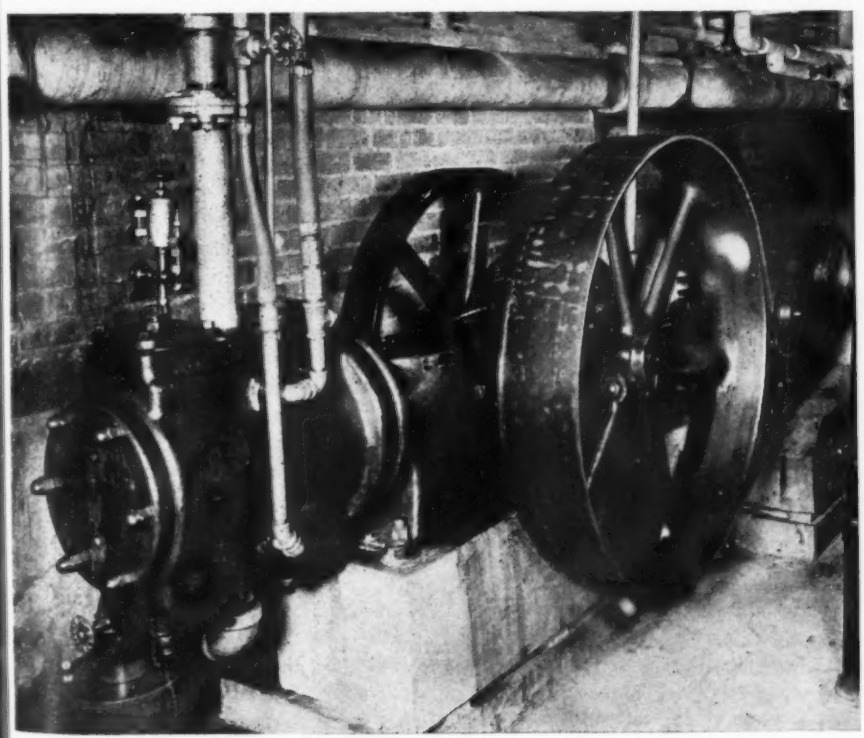
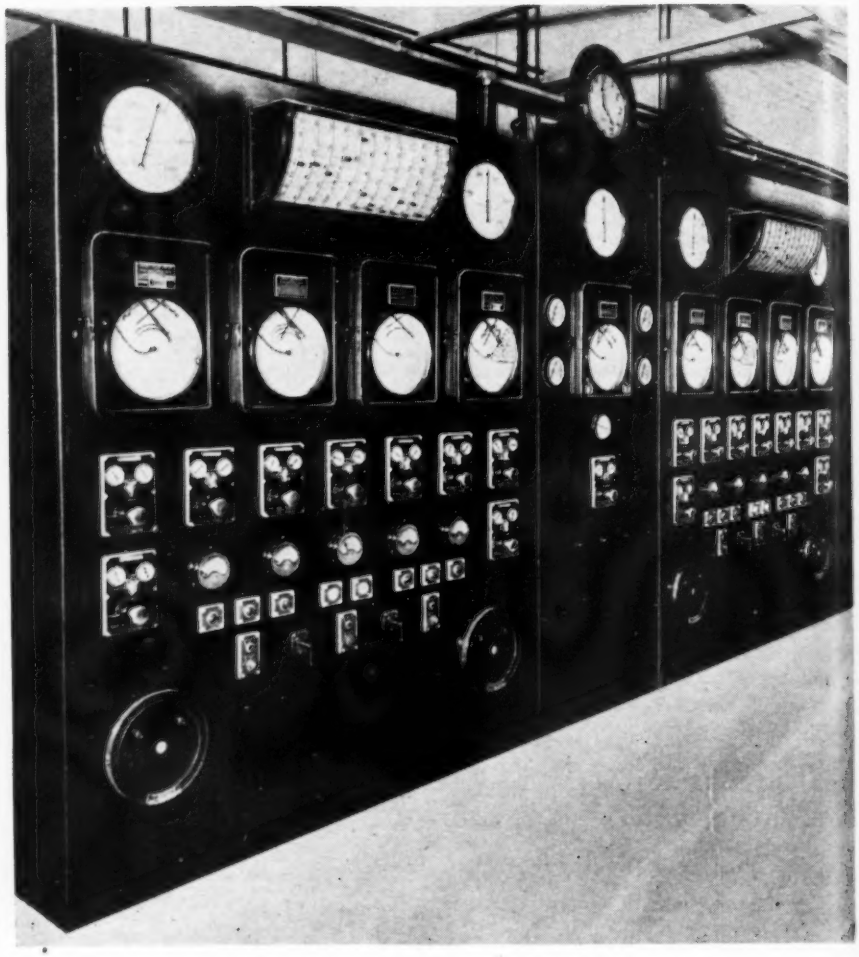


Fig. 4—This 200-cfm unit supplies air to drive Medical School super-centrifuge

# Instruments and Automatic Control:

▶ POWER ENGINEERS must meet an unprecedented demand for power with existing plant equipment, a shortage of fuel and transportation facilities, and a deficiency of trained personnel. Translated into operating requirements, this means obtaining maximum fuel economy; increased life of boilers, furnaces and auxiliaries; improved prime-mover efficiency; maximum boiler output; simplified operation; more efficient use of personnel; and protection against accidents and costly shutdowns. In short, wartime conditions require careful planning and intelligent operation that come only from a full knowledge of power-plant performance. To this end, instruments and automatic control become the power engineer's indispensable tools.

Only through the use of instruments that show what is happening within the pressure and combustion systems can guesswork be eliminated. Data thus obtained provide the basis for an operating plan. Automatic control insures following the plan without deviation under all load conditions and, in addition, increases plant capacity.



**Data obtained from instruments provide the basis of an operating plan, and automatic control insures diligent day-to-day following of the plan under all load conditions**

### *Air and Fuel Ratio*

Theoretically, a definite quantity of air is required to burn a pound of fuel. Practically, there are many other limiting factors, such as type of fuel burned, type of fuel-burning equipment, proper mixing of fuel and air, slagging of tubes, furnace-wall temperature, superheat temperature, and smoke. Weighed by these factors, the correct quantity of air to burn the fuel for a given installation must be determined by tests over a wide range of boiler operation. Proper instruments provide guidance during the tests and the necessary data on fuel-air ratio to determine a plan of operation that results in maximum fuel economy.

Because automatic control has a wide latitude of adjustment, it can maintain test conditions under normal operation, thereby insuring day-to-day performance at maximum fuel economy consistent with the limiting factors for any given installation. As compared to the best manual control, automatic control yields a 2 to 4% increase in boiler efficiency, depending on type of boiler and auxiliary equipment, load characteristics, and skill and diligence of the operating force. This is true because automatic control continuously functions to maintain conditions for which it is adjusted, regardless of how small the change, and is alert to compensate for load changes as they occur.

While automatic control does not function better than a trained operator with centralized controls and sufficient instruments for proper guidance, it can and does do better than the average operator, who may not fully appreciate his responsibilities.

A power-plant operator's duties may be divided into two classes: (1) routine mechanics of controlling fuel, air and water flow, which requires following carefully a prescribed course of operation charted by adequate instruments; (2) detecting, as a result of training, deviations from the normal in performance of boilers and auxiliaries, and then making necessary corrections before serious damage occurs.

An operator does not easily learn to analyze and correct trouble through critical observation of over-all boiler performance, and thus prevent emergency shutdowns. However, a boiler fully equipped with instruments and automatic control greatly speeds the training process.

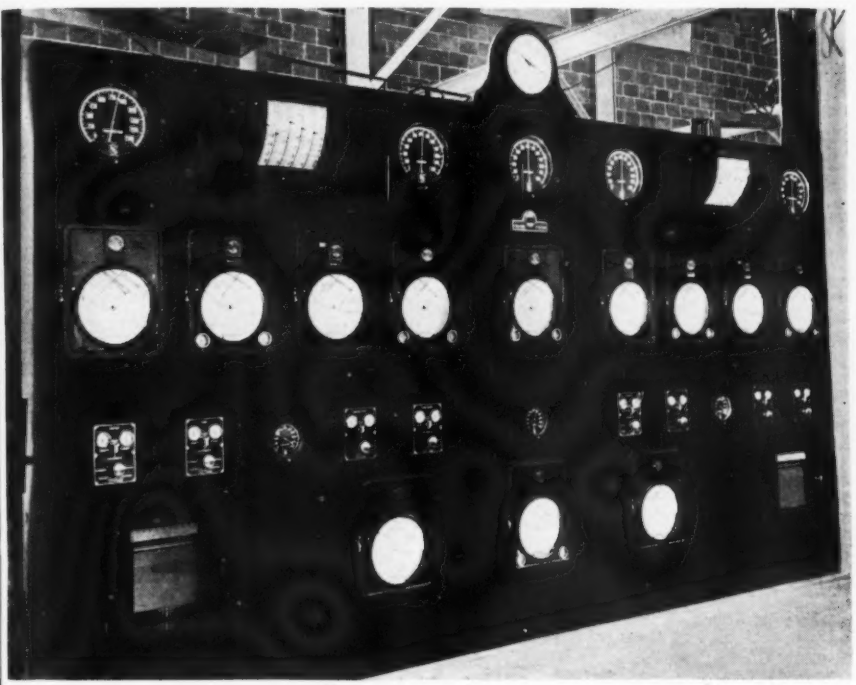
The instruments provide a continuous record of performance, a study of which permits analysis of any particular occurrence. This information, plus adequate instruction, has great value in training a new operator to reach the necessary degree of skill in minimum time.

Automatic control performs the normal functions of controlling fuel, air and water flow. Therefore the operator, released from manipulating controls to compensate for constantly changing conditions, can devote his attention to the plant's over-all performance. For the skilled operator, automatic control simplifies tasks and allows more time to train unskilled operators.

Boiler and furnace life is closely related to proper control of fuel and air, which prevents excessive furnace temperature, extreme variations in

# War Tools for Plant Operation

***H H Gorrie, control engineer, Bailey Meter Co, before the Midwest Power Conference, told how instruments and automatic control help power-plant operators meet the unprecedented demands for power with existing equipment, and do this difficult job with a shortage of trained personnel***



On or near this panelboard are all meters and automatic control to operate the boiler continually under practical test conditions, thus insuring best day-to-day performance

furnace draft, slagging of tubes, excessive superheat temperature, and excessive variations in boiler-drum water level. Automatic control regulates fuel, air and feedwater, and so holds trouble from these factors to a minimum.

Steam from the boiler plant is required at the prime mover or for processes at a specified temperature and pressure. Any deviation from this specified temperature or pressure results in a decrease in plant efficiency, damage to the prime mover, or a loss of product. It is particularly important to maintain pressure and temperature within close limits when operating at high pressures and temperatures that permit very little leeway above the operating standard.

Under these circumstances operators, particularly inexperienced ones, have a tendency to keep pressure and temperature considerably below standard in order to reduce the possibility of prime-mover damage. Automatic control makes it possible to operate more nearly at the desired standard, resulting in a two-fold increase in over-all plant capacity by (1) providing more efficient operation and (2) by guarding against damage to the prime mover continuously.

Often the maximum output of a boiler is limited by the induced or forced-draft-fan capacity. For maximum plant capacity under these conditions, operators must maintain constant vigilance, as capacity limit is approached, to prevent fuel-air ratio or furnace-draft relationship being upset. Conversely, at the lower end of the operating range, operators must take care to maintain proper fuel-air ratio because of danger of ignition loss. These two limits can be safely approached with automatic control. It insures (1) at upper end of range, maximum output from each boiler, and (2) at the low ratings, that each unit remain in operation, if desired, ready to pick up load.

Automatic control also maintains (1) an equal share of the load between all boilers during load changes, thereby keeping the steam plant in balance, and (2) proper operation throughout the entire load range, once the boiler is placed on the line. The latter in itself insures against accidents and shutdowns, especially when complicated fuel-burning or fan equipment is involved in the operating program.

### *Furnace Explosions*

An equally important phase of boiler operation is prevention of furnace explosions during lighting-off periods. Explosions cannot occur upon lighting if (1) furnace is purged of all fuel, (2) ample torch flame is applied properly to each burner in succession before the fuel is turned on, (3) air velocity at each burner is low enough to prevent blowing out the flame, (4) fuel mixture is sufficiently rich to ignite immediately from the torch, and (5) after ignition is established, correct proportion of fuel and air is maintained with a rate of operation high enough to maintain stable ignition.

Two valuable protective devices have been developed recently that guard against furnace explosions: (1) A photoelectric flame-failure detector, installed near the burners, sounds an alarm, or cuts off the fuel supply, or both, in case of flame failure. (2) A purge interlock ties in with the fuel-supply system so that fuel cannot be supplied to the burners until furnace has been properly purged by airflow.

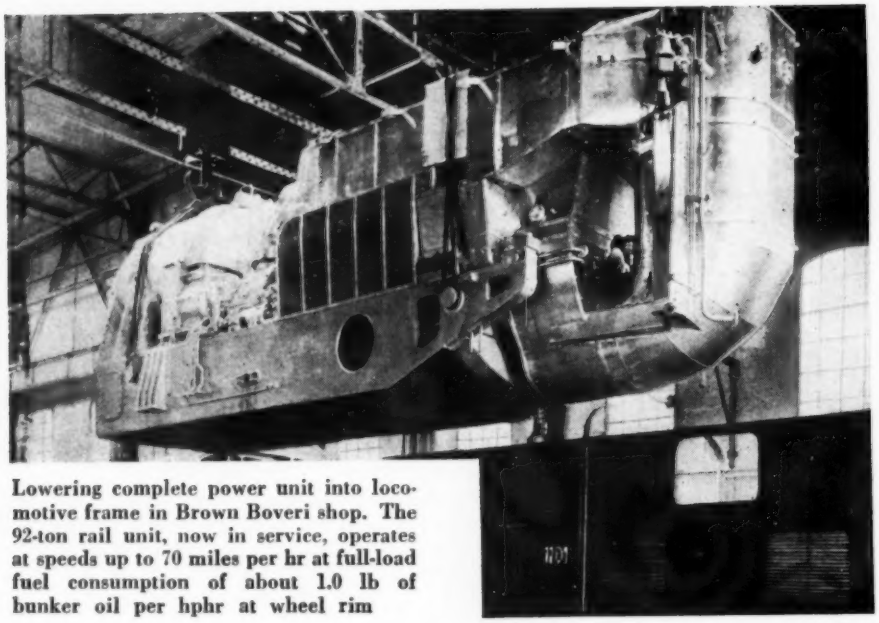
### *Automatic Torches*

Automatic torches have been used to light the main fires. With proper interlocking among fuel supply, automatic torches and flame-failure detectors, complete remote control of the burner lighting is possible, without some of the dangers present when inexperienced, or even experienced personnel, start up the boiler.

Automatic control has established itself as completely reliable and indispensable in practically all processes where continuous performance is required. It is not a panacea for all operating problems, but it is a valuable tool in maintaining constant vigilance in a planned schedule, under all types of operation. Intelligent use of control equipment does much to help operators meet peak capacity loads in spite of fuel shortages, inexperienced personnel and limited plant capacity.

# 2200-Hp Gas Turbine: Compact Power Plant

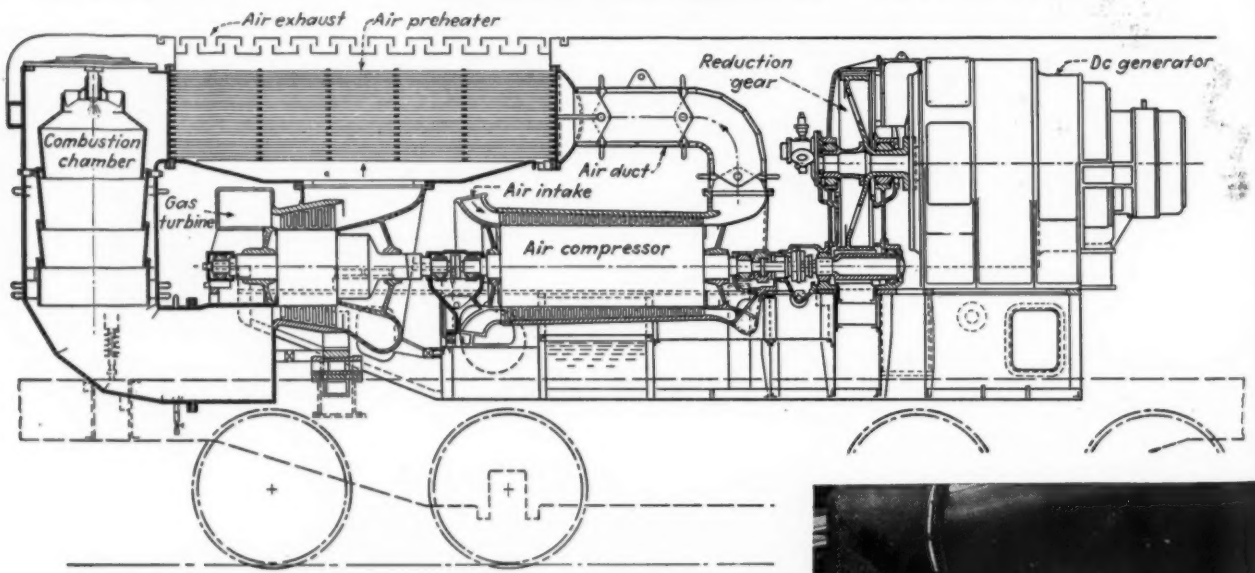
***Locomotive assembly suggests far-reaching possibilities for future self-contained stationary generating plants***



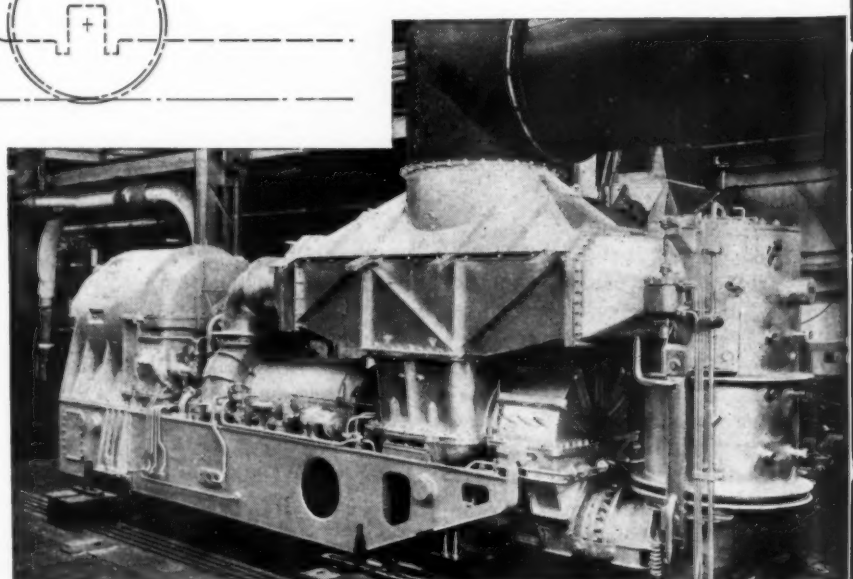
Lowering complete power unit into locomotive frame in Brown Boveri shop. The 92-ton rail unit, now in service, operates at speeds up to 70 miles per hr at full-load fuel consumption of about 1.0 lb of bunker oil per hphr at wheel rim

▶ WHILE GAS TURBINES have so far been used only to produce compressed air for aviation gasoline refining, for railway locomotive power and for a single bomb-proof power plant, future applications in stationary power plants are to be expected. The gas turbine has no reciprocating elements, has small weight per hp, is simple to operate and maintain, offers low first cost and requires no cooling water or other services except starting. Its efficiency can be improved as materials are developed that stand higher temperatures than present 1100-F units.

All commercial units now operating are oil fired. Brown, Boveri and Co, Switzerland, who developed the gas turbine for the locomotive illustrated, have now on trial a 2000-hp unit burning pulverized fuel.




Vertical combustion chamber at forward end of power unit operates under pressure of about 45 psi gage supplied by an axial-flow compressor. Combustion air passes through preheater, then into furnace where temperature of 1100 F is developed. Expansion of gas through turbine provides power for air compression and for driving the geared dc generator



On shop test (POWER, Feb 1940), power unit developed 16% thermal efficiency (about 21,000 Btu per kwhr). After being started by a small diesel auxiliary, operation of gas turbine is completely automatic under control of engineer in cab. Turbine turns about 5000 rpm, generator about 800 rpm

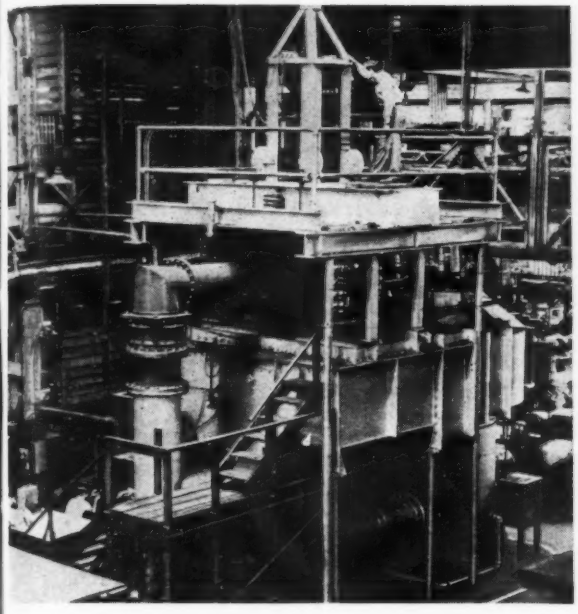


Fig. 1—Test stand includes a 150-hp vertical electrical dynamometer, discharge pipe system of the test pump, a venturi tube, throttle valve, stilling tank and inlet tank

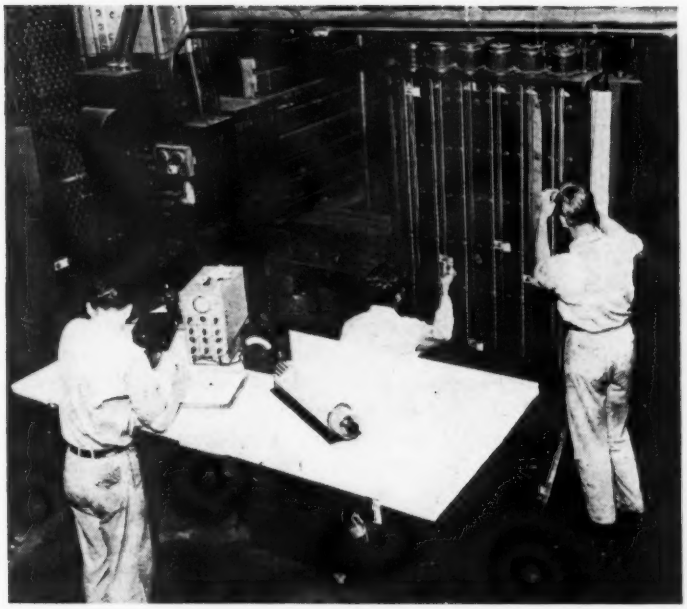


Fig. 2—All measuring manometers are grouped in a manometer rack on the ground floor, along with speed and other measuring devices and controls, to permit simultaneous reading and easy adjustment

# New Hydraulic Laboratory Designed for Precision Testing of Pumps

▶ SCIENTIFIC AND ENGINEERING progress depends, in no small degree, on devising methods by which we can make more accurate measurements. This was the guiding thought of Worthington Pump & Machinery Corp research engineers when they developed their new testing laboratory for basic research in the field of fluid mechanics, as applied to pump design and installation. Demands for new pump designs, particularly those essential to marine space - saving requirements, called for improved test methods to assure the reliability of performance so essential to many war activities.

Among the features of this laboratory are a vertical dynamometer, controlled suction pressure from low absolute to net positive 50-ft head, motor-operated discharge valve for regulating discharge pressure by remote control, and an observation platform on which are mounted all gages and control apparatus.

In this laboratory, Fig. 1, the test circuit consists of test pump and its discharge pipe system, venturi meter, main throttle valve, and stilling and inlet tanks. The laboratory is used particularly for determining the hydraulic operating characteristics of radial, mixed or axial-flow pumps up to 150 hp, with special attention to their cavitation characteristics. Space is provided so that accurate model tests can be made not only of the pump itself but of the whole pump installation.

Tests can be made on pumps of very high specific speeds up to capacities of approximately 1350 gpm. For pumps of lower specific speed, capacity has to be reduced correspondingly to stay within speed limits of 850 to 2000 rpm and 150 hp of the dynamometer. Model pumps may be tested at heads as low as 7 ft and 900 gpm. By means of a booster pump, flow may be reversed and the test pump operated as a turbine.

Test pumps are driven by a vertical dynamometer motor capable of developing 150 hp. To reduce friction to a minimum and thus increase accuracy, the dynamometer motor is suspended inside a supporting frame by a fluted steel rod. This rod carries the total weight of the motor and any thrust load transmitted from the test pump to the motor thrust bearing.

Usually the greater part of the torque is measured by a number of 50-lb weights suspended on steel tapes wrapped around the dynamometer motor and which pass over four pulleys from a horizontal to a vertical direction. The difference between the torque measured by the 50-lb weights and the actual dynamometer torque is measured by an oil piston in a rotating cylinder. Oil pressure in this cylinder is calibrated on a mercury manometer on the operating floor in a common manometer rack, together with manometers of the test stand. This device has proved to be highly accurate, measuring the torque to within 0.1 of 1%.

A precision alternating - current tachometer, coupled to the dynamometer shaft, indicates the speed on an indicating meter having a precision of 0.25%. For closer measurement or for calibration of the indicating instrument, tachometer generator frequency can be compared with the frequency of a precision tuning fork by a cathode-ray oscillograph.

As shown in Fig. 2, all measuring instruments and controls are grouped closely together on the operating floor, permitting simultaneous observation and easy adjustments. All pressures or pressure differences are measured by mercury manometers. Controls are within easy reach while observing test instruments.

# Oil-to-Coal Conversions Still Necessary

***More than half the plants that can convert have switched to coal, but the remainder must, too, because essential needs make it impossible to relax the program. At special ASME meeting, leading engineers tell of lessons learned and give valuable pointers for future conversions***

► To GIVE engineers in the New York area a realistic picture of the present and future fuel-oil situation and to provide helpful technical information in making oil-to-coal conversions, the Steam Power and Fuel divisions of ASME held a joint meeting on March 22 at the Engineering Societies Building. Surveyed, under chairmanship of H C Weisberg, Public Service Co of N. J., were: the oil situation by H B Van Cleve, District I Marketing Director, PAW, conversion to pulverized coal by R M Hardgrove, Babcock & Wilcox Co, and place of stokers in the changeover by Otto de Lorenzi, Combustion Engrg Co.

**Survey of oil situation:** Tracing the conversion and rationing programs, Mr Van Cleve pointed out that as of the end of March approximately 38 million bbl of annual oil consumption has been saved by conversions, about 10 million will be saved by conversions now in process, and more than 23 million still remain to be saved in plants that can, but have not yet converted. A realistic review of the facts shows that every possible conversion is necessary. With fuel-oil demands increasing for around-the-clock production, plant expansion and tremendous military consumption, gains in oil production and transportation will barely keep next winter's supplies abreast of essential needs, with no improvement in the civilian situation.

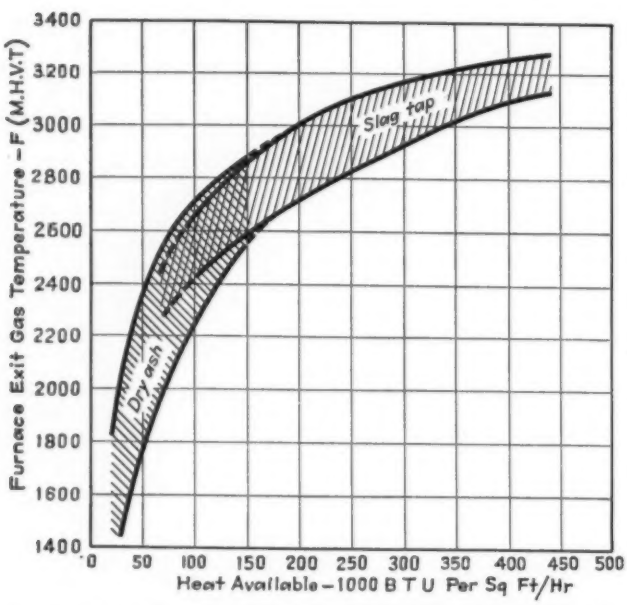
**Conversion to pulverized coal:** Although many oil-fired furnaces can convert to pulverized-coal firing without major difficulty, possible loss of capacity is a serious consideration, according to Mr Hardgrove. In general, for a given capacity, successful pulverized-coal firing requires more water-cooling surface than oil firing does. The amount of water-cooling surface needed depends on whether the furnace operates dry bottom or slag tap, and on nature of coal to be burned.

### *Measure of Furnace Loading*

Although heat liberation in Btu per cu ft per hr finds common use as a measure of furnace loading, Mr Hardgrove pointed out that furnace volume alone has little effect on temperature and that a better measure is *heat available* per sq ft of water-cooled surface per hr. Heat available means heat in fuel burned, plus heat in preheated air, minus latent heat of water vapor in combustion products. Fig. 1 shows furnace-exit temperature, as measured by multiple-shielded high-velocity thermocouples, plotted against heat available for a large number of actual pulverized-coal installations. Fig. 2 shows softening temperature of coal ash plotted against heat available.

For example, consider an oil-fired unit of 70,000 lb per hr capacity: With refractory floor and waterwalls, it shows a heat-available figure of 115,000 Btu per sq ft per hr—rather low for oil-fired units that may go above 200,000. Note in Fig. 1 that on coal the furnace-exit temperature would run close to 2600 F—too high for satisfactory dry-bottom operation. Putting cooling tubes on the furnace floor would cut heat available per sq ft of water-cooled surface to 101,000 Btu per hr, but this leaves furnace temperature at 2550 F—still too high.

To bring temperature down to a range that assures reasonably satisfactory operation on normal coals, steaming capacity has to be cut. In this case, dropping capacity to 52,000 lowers furnace temperature to 2445 F, which is still high but within possible operating range using a coal with high ash-fusion temperature. In cases like this, when



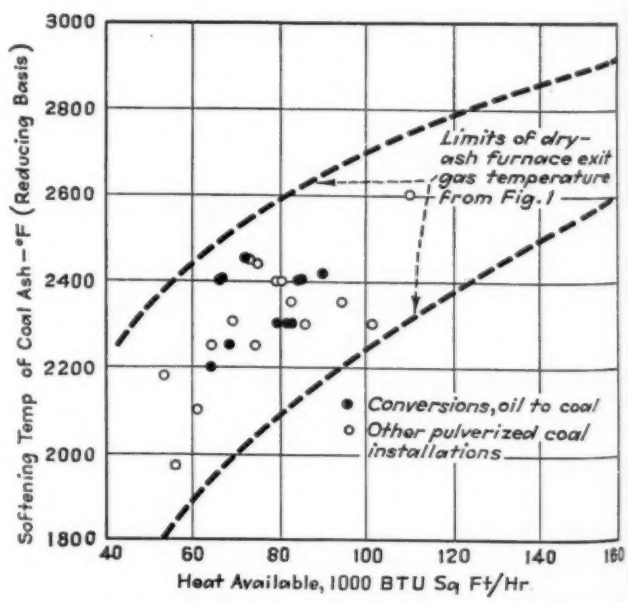




**Fig. 1 (left)—Range of gas temperatures leaving coal-fired furnaces of both dry-ash and slag-tap types at different rates of heat input**

**Fig. 2 (right)—Approximate relation between ash-softening temperature and heat available, in pulverized-coal units**

Fig. 4—Upper curve shows reduction in furnace exit temperature resulting from recirculating various percentages of flue gas and from supplying tertiary air. Lower curve shows reduction in efficiency resulting from recirculating flue gas or supplying tertiary air (right)

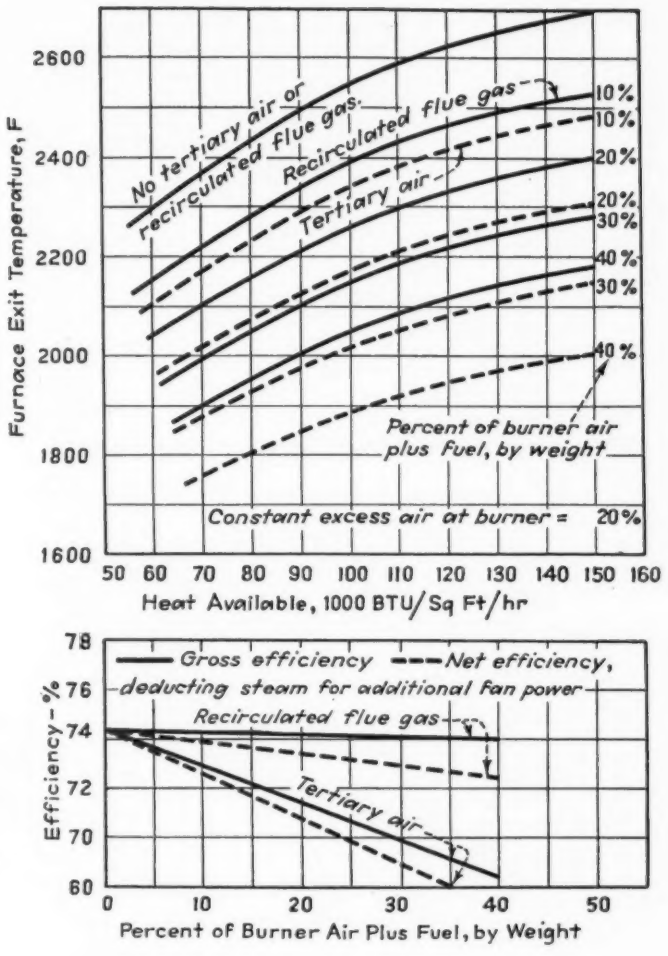
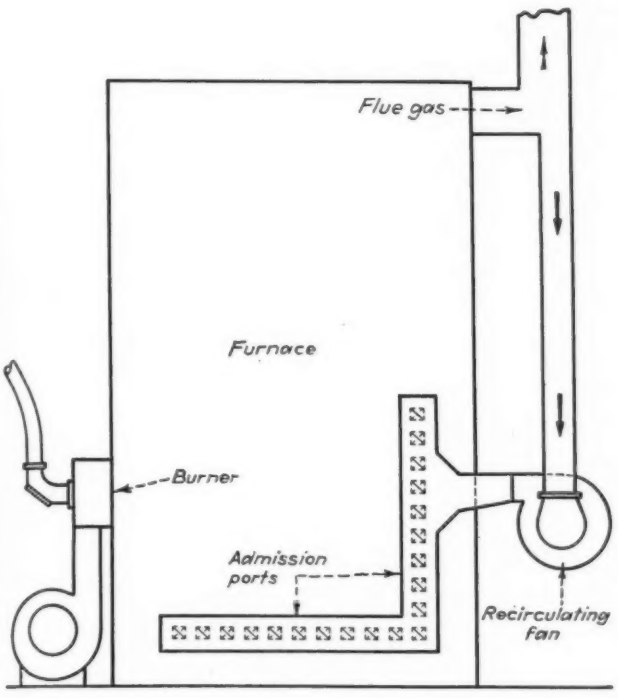



Fig. 3—Diagrammatic layout for recirculating part of flue gas into boiler furnace to reduce exit temperature




no more cooling surface can be added and capacity reduction must bring operation within reasonable limits, recirculation of flue gas offers possibilities.

For instance, taking part of the flue gas from the breeching and reintroducing it into the furnace acts somewhat like high-excess air—that is, flue gas, like high-excess air, "dilutes" the hot products of combustion in the furnace and thus lowers temperature; also, net boiler efficiency falls slightly because greater fan power is needed. However, there is one important difference: excess air increases dry-gas loss and thus lowers efficiency still further, but dry-gas loss does not change when flue gas is recirculated. Thus recirculation can remedy difficult furnace conditions at the cost of an increase in fan power.

In the example above, recirculating 27% of the flue gas can hold boiler capacity at the original figure of 70,000 lb per hr, and pull furnace temperature down to 2180 F. This insures dry-ash operation and elimination of slagging troubles. Additional fan power required is 23.3 hp compared with a total of 32.7 hp on oil. Unit's efficiency on oil is 79%; on coal, at the same rating but with excessive furnace temperature, 74.3%; and with flue-gas recirculation, 74.1%. Fig. 3 shows diagrammed arrangement for flue-gas recirculation.

To show the general effect of recirculating flue gas, compared with increasing excess air in the form of tertiary air, Fig. 4 plots furnace temperatures, for various percentages of tertiary air and recirculated flue gas, against heat available. Curves are based on assumed conditions less favorable than average. Top curve represents furnace temperature with 20% excess air and no tertiary air or recirculated flue gas. Lower dotted lines show temperatures with tertiary air added. Solid

(*Continued on page* 180)

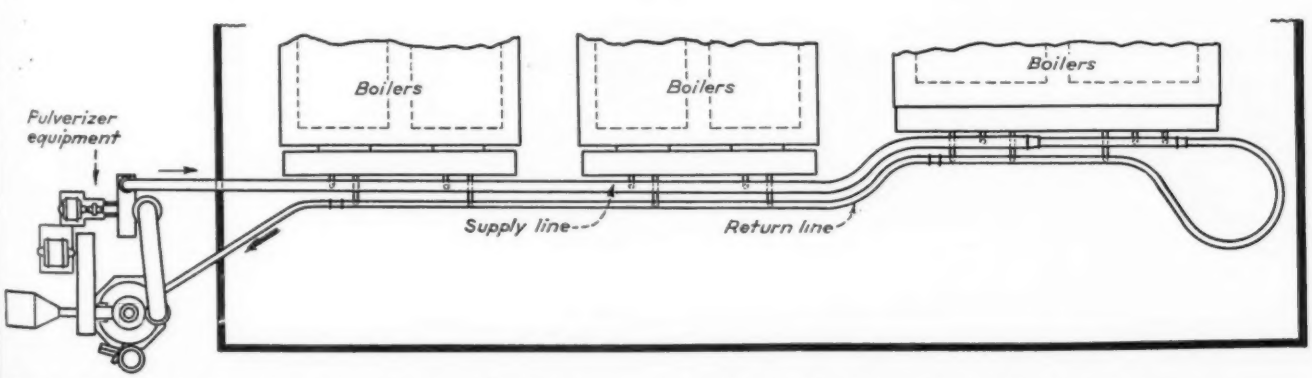
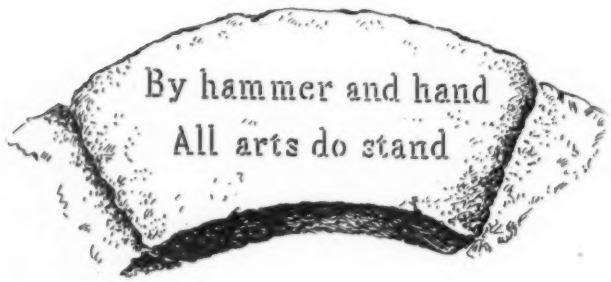



Fig. 5—Single pulverizer unit located outside building serves group of six boilers by use of direct-fired circulating system

# THE OLD CHIEF




***Another in the series by William Doran, chief engineer, Essex County Sanatorium, Windsor, Ontario. Writing of the inspiration of the past, he has captured much of the human side of engineering that lies just beneath the maze that is woven of power plant costs and the wavy lines on paper disks***

**Pretended to select the mild steel by smelling all three**

In the border country that lies between England and Scotland, there is an old blacksmith's shop that was built of granite in the seventeenth century. In the keystone of the archway over the door there is deeply carved the couplet:

By hammer and hand
All arts do stand.

The claim put forth in the old rhyme is perhaps not so widely supported today as it was in days gone by, but in the Old Chief's time engineers definitely belonged to what was then referred to as "the black squad," and sometimes it was hard to determine whether they were engineer blacksmiths or blacksmith engineers. Such jobs as drawing rods, making tools, heat welding, shrinking pins and sleeves and, of course, riveting were part and parcel of the day's work.

The Old Chief himself was quite a blacksmith. He taught me many tricks of the trade, such as determining degree of heat by color and removing or replacing the temper in springs. There is no doubt about it. A well turned-out blacksmithing job affords a man a good measure of satisfaction and pride. Your true blacksmith can tell a fellow craftsman by just listening to the ring of his hammer. The true anvil man does more with a few solid well-directed hammer blows than an inexperienced man accomplishes in hours of "off-angle" ineffectual tapping.

Old Bob was our blacksmith at the old plant; he was also our coppersmith and tinsmith. I remember him as a testy old fellow, who had no time for us young punks and who was always vague as to when a job might be finished. His usual answer was, "It'll be done when it's finished."

### *Sense of Smell*

But I recall one instance when he displayed enough humor to pull off a practical joke on one of the apprentices. The boy had been asked to make three-quarter-inch studs out of mild steel and he came to Old Bob with three pieces of round stock to ask him which of the three was mild steel. Bob could have told by "ringing" them on his anvil, but he recognized the stock by the markings and pretended to select the mild steel *by smelling all three pieces.*

Next day the boy returned and confessed to Bob that there must be something wrong with his "smeller." "I've smelled everything from cast iron to bronze," he said, "and the only smell I can get is oil."

### *Out of His Depth*

Speaking of blacksmiths, the Old Chief once told me a story about a blacksmith's striker. Although he had had very little experience at the game, he thought he could pass himself off as a full-fledged tradesman. And so he journeyed to another town where he soon found a job.

The first task handed him by the foreman blacksmith was making a "head" for a 14-pound sledge. He drew out a billet and whacked away at making a head. But when it came to drifting the hole through the center, things went all wrong so that by noon the job did not resemble a hammer head.

Nothing daunted, he went outside during his dinner hour and at the hardware store purchased a new head. This he heated in his forge and marked up to look like a handmade job. "Very good," said the foreman when he came along. "Better make me a couple of dozen." This was too much for our would-be blacksmith. Slowly he put on his coat and soon he was back at his old job. He had wisely decided to add knowledge and skill to ambition.

Another blacksmith story that the Old Chief told me concerns a shipyard where one fine morning the bosses found themselves without a foreman blacksmith. The general manager and his assistant, together with the works manager, descended on the dock superintendent with the information that if it was agreeable they would appoint one Andy McKee as blacksmith foreman. The superintendent bristled. "Certainly not," he protested. "Any of these other d—— fools will make a good foreman, but leave Andy McKee alone. He's the best blacksmith I've got."

In these days when so many of us are interested in training youth, it might not be a bad idea to remember that "by hammer and hand all arts do stand."

**Practical suggestions for creating emergency capacity . . . substitutes for hard-to-get parts and materials . . . cures for overloads, breakdowns . . . ways to build up short-handed staffs. Share your ideas! Send in your rough notes and photos or sketches. Payment at regular rates**

# WARTIME POWER CLINIC

Whether it's a concrete filling (see below) to reinforce thinned walls of a pump plunger, or a bit of well-placed filing on glands (page 100) to relieve excessive packing pressure and cure a hot stuffing box, American ingenuity generally finds a practical answer when wartime restrictions rule out normal methods of repair and operation. Who can offer similar examples, including short cuts in conversion of oil-burning furnaces to coal?

## Repairs Without Priority

HERE'S AN UNUSUAL STORY of a pump repair that "saved" a difficult situation. In the isolated power plant of a large office building, this steam-driven, tandem-duplex, center-outside-packed plunger pump works against water pressures up to 240 psi. High- and low-pressure steam-cylinder bores are 12 in. and 18 in., respectively—pump plunger diameter 8½ in. The stroke is 12 in.

During the pump's quarter century of service the hollow, bronze plungers had been trued several times in the lathe. This so reduced the wall thickness that one wall collapsed several inches near the middle.

At first this did not bother us; we had had this kind of breakdown before. All we had to do was order a new plunger from the manufacturer—or so we thought.

Instead of a new plunger we received the jarring information that this equipment had been placed on priority, and that our priority number was not high enough to do us any good.

But all was not lost; we figured we would get a piece of extra-heavy brass pipe and weld it on the ends of the old plunger. Here, again, we were out of luck. The supply house told us that all brass pipe was "frozen" and that our priority number wasn't good enough to get any. So we were thrown on our own to find a way to get the old plunger back on the job.

Our first idea was to build up the thin spot by welding or brazing. We cradled the plunger in firebrick and asbestos cement and applied heat to its entire length to insure even temperature and prevent distortion while welding. Then we filled the depression with bronze welding rod and trued up the whole plunger in the lathe.

To find out how much metal remained we drilled four test holes, equally spaced around the circumference and near the middle of the plunger. These showed that the walls were too thin to stand up against the combined pressure of water and packing, so we backed the metal with concrete, filling the hollow space with a rich, wet mixture of cement and sand, well tamped.

This fixed the plunger, but the reduced plunger diameter gave us another problem—a large clearance at the gland and at the bottom of the stuffing boxes. Here, again, we tried to buy brass to bush the glands and stuffing boxes, without success. We didn't have the right priority.

Once more forced back on our own resources, we scouted around the plant and found two old engine piston-rod glands, discarded years ago and about to be handed over for the scrap drive. The machinist turned out four rings from the flanges of these old castings. He cut the rings in half and doweled them to hold the halves in line in the stuffing boxes. These rings act as top and bottom holders for the packing.

The repaired machine runs as well as ever, except that the repaired plunger strokes a little faster than the one on the other side. No doubt this is caused by the reduced diameter of the plunger.

Incidentally, we expect this repair to last for the duration.

*Ramsey, N. J.* R W RIORDAN

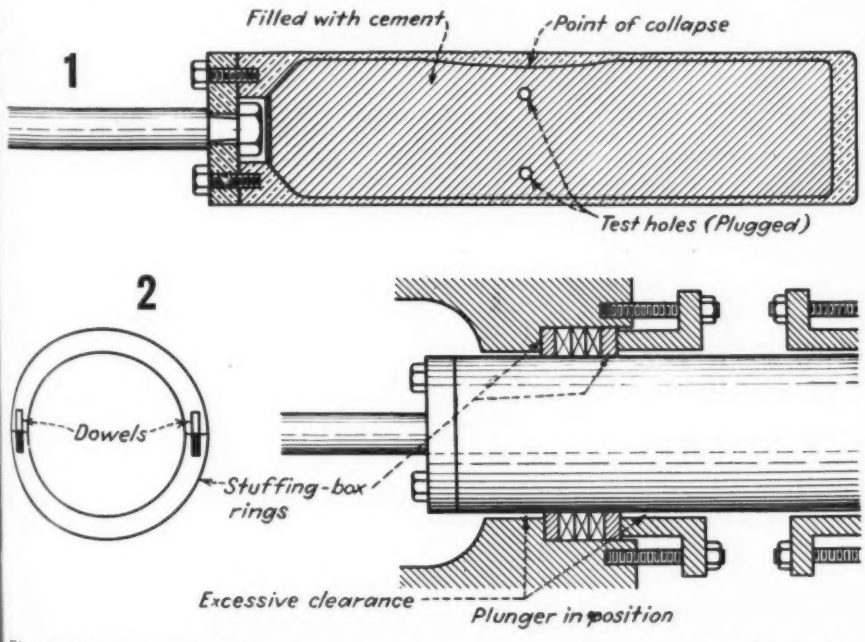



*Fig. 1 After bronze welding low spots, plunger was trued in a lathe and filled with concrete. Fig. 2—Special stuffing-box rings take care of undersized plunger*

## Bomb Protection

IT IS STILL POSSIBLE that some of our plants may be bombed before this war ends. Complete shutdown would result

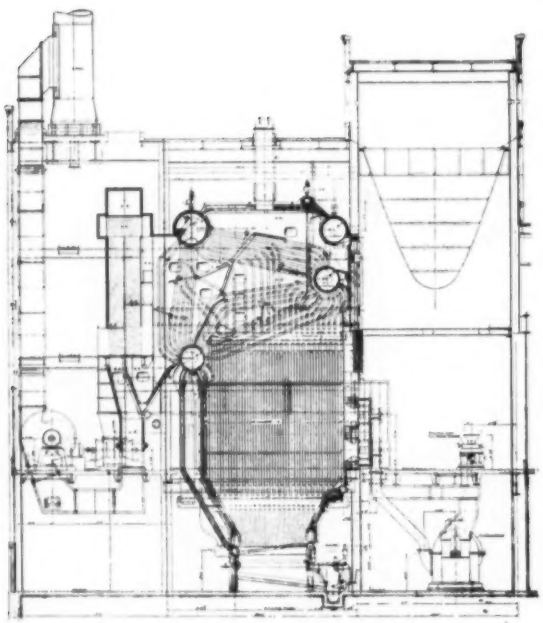
(*Continued on page* 100)

# 13 Riley Boiler Units Installed

During the past eight years, one of the country's largest chemical companies placed five different orders with the Riley Stoker Corporation for a total of 13 complete Riley Steam Generating Units.

ONE COMPANY — 5 ORDERS — 13 RILEY UNITS

| | | | | | | |
|---|---|---|---|---|---|---|
| 3/16/1935 — 3 - 80,000 lbs./hr. | Riley | Pulverized | Coal | Fired | Units | 630 lbs. - 650° F. |
| 2/13/1936 — 2 - 100,000 lbs./hr. | " | " | " | " | " | 630 lbs. - 650° F. |
| 3/13/1941 — 2 - 170,000 lbs./hr. | " | " | " | " | " | 675 lbs. - 650° F. |
| 3/12/1942 — 3 - 170,000 lbs./hr. | " | " | " | " | " | 450 lbs. - 575° F. |
| 5/16/1942 — 3 - 170,000 lbs./hr. | " | " | " | " | " | 450 lbs. - 575° F. |



INITIAL INSTALLATION
3-80,000 lbs./hr., 630 lbs.-650° F. Riley Units

In 1935, this company installed three of the above Riley Units, consisting of Riley Boilers, Superheaters, Water - cooled Furnaces, Air Heaters, Steel-clad Insulated Settings, fired by Riley Pulverizers and Burners.

Guaranteed Efficiency-83.5% at 70,000 lbs./hr.
Actual Efficiency - 84.1% at 76,875 lbs./hr.

These units not only operate at higher than guaranteed efficiency but also at higher than guaranteed capacity. During the past year they operated at an average capacity of 104% with even higher peak loads and with an availability factor of 97%.

These facts afford positive evidence of the complete satisfaction secured by this company from their Riley Boiler Units—of course, a visit to this plant, a thorough investigation of their Riley Units and talks with their operators will more completely convince you of the satisfactory performance of Riley Steam Generating Units—will thoroughly convince you that "you can rely on Riley."

Riley units give such a good account of themselves because each detail of design and construction is carefully and correctly engineered. Rapid positive circulation, always a distinctive Riley characteristic, gives efficient heat transfer, permits high operating capacities and minimizes maintenance; baffling is arranged to give cross flow of gases and intimate contact between gases and the entire heating surface; large steam release drums with the Riley Steam Washer assure clean dry steam and steady water level; adequate furnace volume elimintes objectionable clinker and slag accumulations; proper expansion and structural provisions further eliminate difficulties. These are probably the reasons why when a company once installs Riley Boiler Units, they almost invariably repeat with more Riley Units when installing additional units.

# RILEY

**STOKER CORPORATION, Worcester, Mass.**

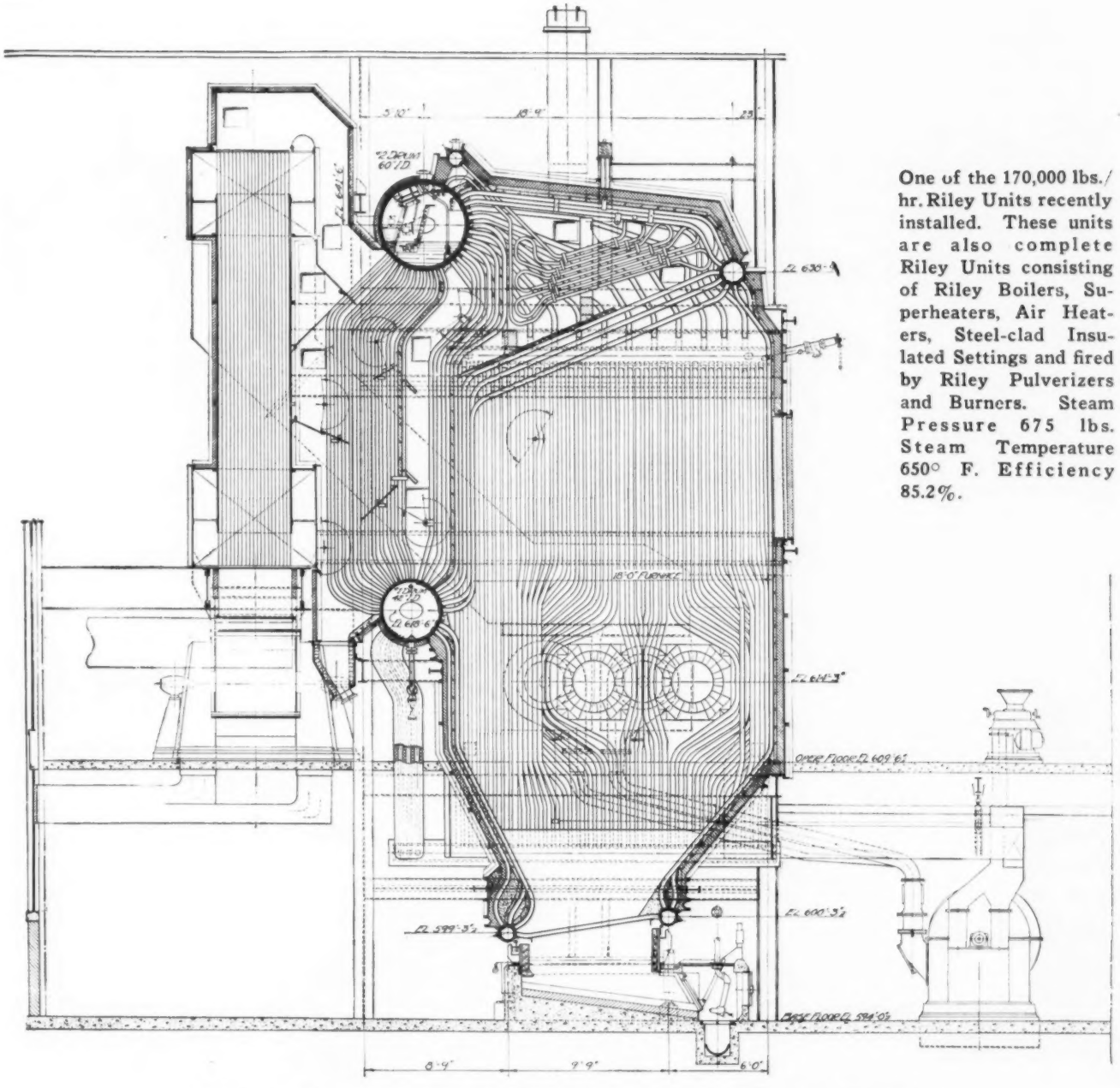
Boston New York Philadelphia Pittsburgh Baltimore Buffalo Cleveland Detroit
Chicago St. Louis Cincinnati St. Paul Kansas City Denver Seattle
Portland Los Angeles Houston New Orleans Atlanta Memphis Richmond

COMPLETE STEAM GENERATING UNITS

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS
AIR HEATERS • ECONOMIZERS • WATER-COOLED FURNACES
STEEL-CLAD INSULATED SETTINGS • FLUE GAS SCRUBBERS

**It will pay you to visit modern Riley Installations**

# in the past 8 years by this Company



One of the 170,000 lbs./hr. Riley Units recently installed. These units are also complete Riley Units consisting of Riley Boilers, Superheaters, Air Heaters, Steel-clad Insulated Settings and fired by Riley Pulverizers and Burners. Steam Pressure 675 lbs. Steam Temperature 650° F. Efficiency 85.2%.

## ALL OF THESE COMPANIES HAVE PLACED FROM ONE TO SIX REPEAT ORDERS FOR RILEY BOILER UNITS

Carnegie Illinois Steel Corp.
Commonwealth & Southern Corp.
General Motors Corp.
The Bullard Co.
Humble Oil & Refining Co.
Celanese Corp. of America
Swift & Co.
Revere Copper & Brass Co.
Norton Company
Western Cartridge Co.
Scoville Mfg. Co.
Allis-Chalmers Mfg. Co.
Curtiss Wright Corp.
Union Electric Co.
Carbide and Carbon Chem. Co.
Crown Cork & Seal Co.
Container Corp. of America
U. S. Gypsum Co.
Modine Mfg. Co.
Beechnut Packing Co.
Great Western Sugar Co.
American Brass Co.
Shell Oil Co.
Winchester Repeating Arms Co.
Dow Magnesium Co.
General Electric Co.
Standard Oil Co. of N. J.
Pet Milk Co.
Ohio Salt Co.
Publicker Comm. Alcohol Co.
General Aniline Works
Mead Corp.
Houston Lighting & Power Co.
A. O. Smith Corp.
Standard Oil Co. of Calif.
Masonite Corp.

before purchasing Boiler or Fuel Burning Equipment

(*Continued from page* 97)

in some cases. With quick return to operation as the objective, it would be up to the engineer to make emergency repairs to the steam, water, sewage and electrical systems. Planning and preparation could easily cut such repair time in half.

In many large plants, with buildings spread over several acres, many of the steam, water and electrical lines are underground. Find their exact location now and make a permanent map record. If you are never bombed, the information will still be of great value.

If an aerial bomb hits any of these outside lines, the man in charge is faced with two immediate problems: First, he must immediately cut off water, steam and electricity from the affected lines to save life and limit damage. To do this quickly, he must know in advance how to get at the right valves and switches. Second, a bomb crater near a water or sewer main fills with water immediately. This water must be pumped out before any repairs can be made, and the right pump to do the job must be at hand.

For this work, a centrifugal pump is the most dependable type. Therefore, if you have a spare centrifugal unit around the plant, why not get it out and check up its condition and capacity? Also, check its speed and suction lift.

After making sure that pump is serviceable, mount motor and pump together on a channel-iron bedplate or other suitable base.

If you cannot find a good hose for the suction side, make up piping with swing joints. When you take a pump of this type to a crater and connect it to an electrical extension, you can empty the hole in a few minutes and then start repairs. If the hole is not large, an ordinary hand pump might do the job.

Rotary pumps are not suitable for work of this kind that involves muddy or gritty water. Most reciprocating pumps require steam, which complicates their emergency use. Also, they are excessively heavy for a given capacity.

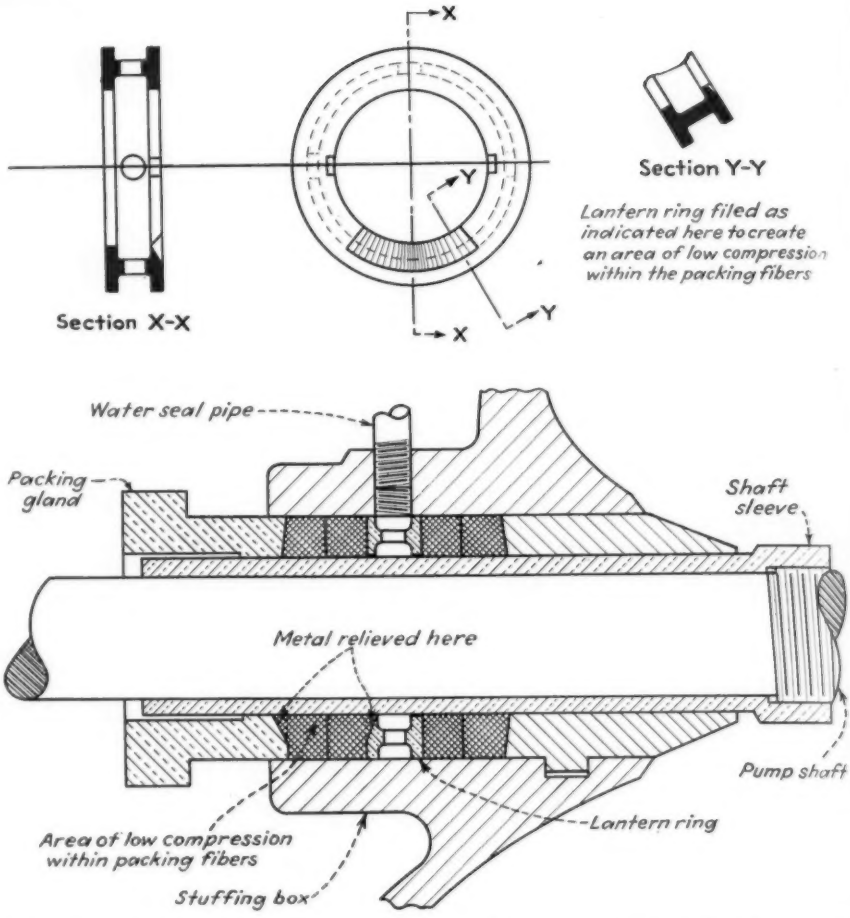
What should an engineer do if he is faced with an emergency requiring him to repair a line under water quickly and thoroughly? Why not study that problem now and build emergency equipment for the purpose?

In any case, ask yourself these two questions now:

1. What is the exact location of all my steam, water, sewage and electrical lines?

2. How can I prepare now to repair these lines with the least possible delay?

*Aurora, N. Y.* I W DUDLEY




***Formerly, sealing-water pressure squeezed the packing, prevented leakoff and made the stuffing box run hot. Filing bevels, as shown, relieved pressure, permitted water leakage and thus multiplied pump-sleeve life***

## Stuffing-Box Trouble Easily Cured

SHAFT SLEEVES AND PACKING wore rapidly on our two large single-stage double-suction vacuum-primed centrifugal pumps. The cause was hard to spot—no evidence of cutting or scoring by gritty water, and very little end play of the pump shaft.

Both pumps deliver Delaware River water to a common discharge pipe at 125 psi. One pump is always running, with the other standing by.

Since all four packing stuffing boxes are under vacuum, they are sealed with water piped from the pump discharge, with valves in the connections to throttle down the pressure.

To avoid losing any vacuum, the engineer in charge had a tendency to overtighten the packing glands and admit too much water to the stuffing boxes, particularly when he was priming a pump to put it on the line.

When this water was admitted to the center of the stuffing box, see sketch, it did not leak off fast enough to relieve the 125-psi pressure. With a 2-in. sleeve diameter and a 3-in. stuffing-box inside diameter, the *piston area* subjected to this pressure was $0.785 \times (3^2-2^2) = 0.785 \times (9-4) = 0.785 \times 5 = 3.92$ sq in. Total force figured $125 \times 3.92 = 490$-lb squeeze on the packing, making bleedoff impossible and forming a water pocket between packing and lantern ring.

This situation caused confusion. When the engineer saw the box was running warm, with no leakoff, he naturally tried to cool it by opening up the sealing-water valve, which merely made the trouble worse.

To remedy the difficulty, we filed a bevel on the lantern, as sketched, to relieve pressure on the inner packing fibers in this section and to permit the sealing water to bleed off before the pressure could build up.

When the engineer now sees the water running off freely, he is, if anything, tempted to throttle the sealing-water valve rather than open it wider.

In this way, we made the adjustment of the sealing water foolproof and extended the useful life of the pump sleeves from weeks to months.

*Philadelphia, Pa.* EMIL WITTMAN

# TRANSPORTATION—a vital war factor

## *The effectiveness of our armed forces and civilians alike depends on the efficiency of our transportation*

As the battle of Tunisia entered its final phases, with the British and American forces joining hands to crowd Rommel into his last fox hole, Hitler and Mussolini held their twelfth war-time meeting.

One important purpose of this meeting, according to the Berlin radio, was the study of a specially prepared "Survey of Continental Reserves". Topping this list of resources is the item of transportation.

Hitler has a great many headaches these days but, according to no less an authority than the Reich Ministry of Economics, "the central problem of the whole German war effort is transportation". It is, in fact, the Achilles' heel of Germany's War Machine.

The Nazis have become soberly conscious of its crucial importance and Mr. Hitler must wince when he recalls the gigantic miscalculations which led him to neglect his railways.

He counted on a short war, not a long wear-and-tear war and Germany's transportation crisis is getting more critical by the hour. It will play a vital part in its defeat.

This is a war of movement—on land, on sea and in the air. Russia's 2,000 mile battleline, R.A.F.'s 700 mile bombing raids, General Montgomery's 1,500 mile advance last November and the vast area that constitutes the theatre of war in the Pacific make this fairly obvious.

Peace will come when one side gets control over the world's supply of fuel, oil and rubber, for on these three critical materials depend all the vehicles of war—as well as of peace.

An army used to travel on its stomach. Today it travels on its fuel tank.

On the home front, transportation is no less vital. Here it is essential in getting the war workers, their raw materials and their products, to and from the mines, mills and factories that supply our armed forces and those of our Allies. Transportation is a major factor in the nation's ability to out-produce its enemies. Every known method, every type of vehicle becomes essential, for no single group of carriers, freight or passenger, can meet all our needs.

The railroads opened the vast resources of our nation and continue to be the backbone of our transportation system. Today they are doing the greatest job in their history. They are hauling more tons of freight more miles than ever before—33% more than in 1941 and 55% more than in 1918, peak year of the first World War. They are carrying more passengers more miles than ever before—80% more than in 1941 and 24% more than in 1918. They are getting more work out of each car, each engine, and each mile of track than ever before. Private operation of railroads is proving far more effective and efficient in this war than did government operation in the last war.

In contrast to Hitler's Germany, the managers of the American railroads have not neglected their plant except where government priorities forced them to do so. They are turning in an unprecedented performance despite the long starvation period to which they were subjected. During the first World War the total investment in the American railroad plant was about $18,600,000,000. Since then $12,000,000,000 have been spent on improvements and after deductions for scrapped facilities the net increase has been $8,000,000,000. Since the present war in Europe began the railroads have invested about $1,650,000,000 in further improvements, many of them to meet special war needs.

Convincing evidence of the railroads' flexibility in meeting the special needs of all-out war is their performance in coping with the movement of oil to the East Coast. In January 1942, one month following Pearl Harbor, the railroads delivered to the East Coast by tank car less than 100,000 barrels daily. By December they had stepped this up to more than 740,000 barrels and during the week ended April 3, 1943 they

*This is the eleventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.*

averaged more than 900,000 barrels per day. By the end of this year they are shooting for the goal of one million barrels a day.

Unlike Germany we have not attempted to control the development and growth of motor transportation according to the "intuitions" of one man but have wisely left it in the hands of experienced competition. That is how our highway transportation system came into being. Growing public acceptance has made it an essential part of our national economy.

The motor vehicle, its limitations set only by the improved highway and the supply of fuel and rubber, has developed to undreamed of proportions. Up to a year ago private automobiles consistently moved more people more miles than *all public carriers combined*. Buses have become an accepted means of mass transportation. Local electric and interurban railways in many cases were converted to bus lines and trucks took over the local freight services. Under these improved operating conditions traffic volume increased. When the war in the Pacific made it necessary for us to conserve our supply of rubber and the U-boat depredations in the Atlantic throttled the flow of gasoline to the eastern seaboard, our motor transport was forced to grapple with the toughest problem that ever had confronted it since it became so vital a factor in the every day transportation.

The "share-the-ride" idea recognizes the need of conserving gas, oil and rubber. This particularly applies to buses, for wherever groups can be assembled for a common destination, buses can be used most effectively. The intercity bus performs for the rural areas the same service that the local bus renders for the residential areas of our cities.

Reorganization of railroad schedules, adaptation of motor transport, rearrangement of working hours, all have contributed to provide a flexible transportation service for men and materials to meet the critical needs of the war effort. Twenty thousand intercity buses are handling 635 million passengers a year which is 69 per cent more than in 1941. The fact that these buses carry a relatively larger percentage of the total coach passenger business than their seating capacity would indicate suggests that here, too, we are getting a more efficient use of these vehicles in terms of passenger loads carried. It is fortunate to note that the geographic location of most intercity bus lines does not coincide with that of the railroads but rather supplements it.

The contribution which the urban transport industry is making to the war effort becomes apparent when we consider that buses, trolley buses and street cars today carry passengers at a rate which promises to exceed the impressive total of 21 billions, as compared with 18 billions in 1942 and an average of 13½ billions for the period 1936 to 1941. And this the industry is accomplishing with a minimum of added equipment and despite a serious drain on its manpower.

The truck lines, too, are setting all-time records. They have rearranged their schedules, eliminated circuitous routes and coordinated their services with those of other carriers. As this is written, contract truckers with the cooperation of the Office of Defense Transportation are trying to eliminate the empty return trip.

The transportation industry as a whole is face to face with the biggest job in its history. Increasing traffic loads, with little if any new equipment, difficulty in obtaining essential maintenance materials and a growing shortage of manpower, combine to make it that. While federal authorities, acting through the Office of Defense Transportation, took prompt cognizance of this condition, froze equipment and otherwise acted to conserve the vehicles then in service, it was not possible to add sufficient vehicles to keep pace with the increased traffic demand. However, the O.D.T. did lend impetus to the movement for staggering hours of work thereby spreading the peak loads and thus increasing the carrying power of existing fleets of vehicles in city service.

As we review the problems involved in meeting our transportation needs it is evident that we cannot depend upon new equipment alone for their solution. Lend-Lease is taking a considerable share of our much needed output of transportation equipment. The immediate job is up to the rank and file of the transportation industries. It is up to their resourcefulness and devotion to their job. The operating men out on the road, the men in the shops who keep the equipment going, who make the most of the metals and other materials they can have, who salvage, conserve and economize . . . these are the men who must bear the burden of our war load.

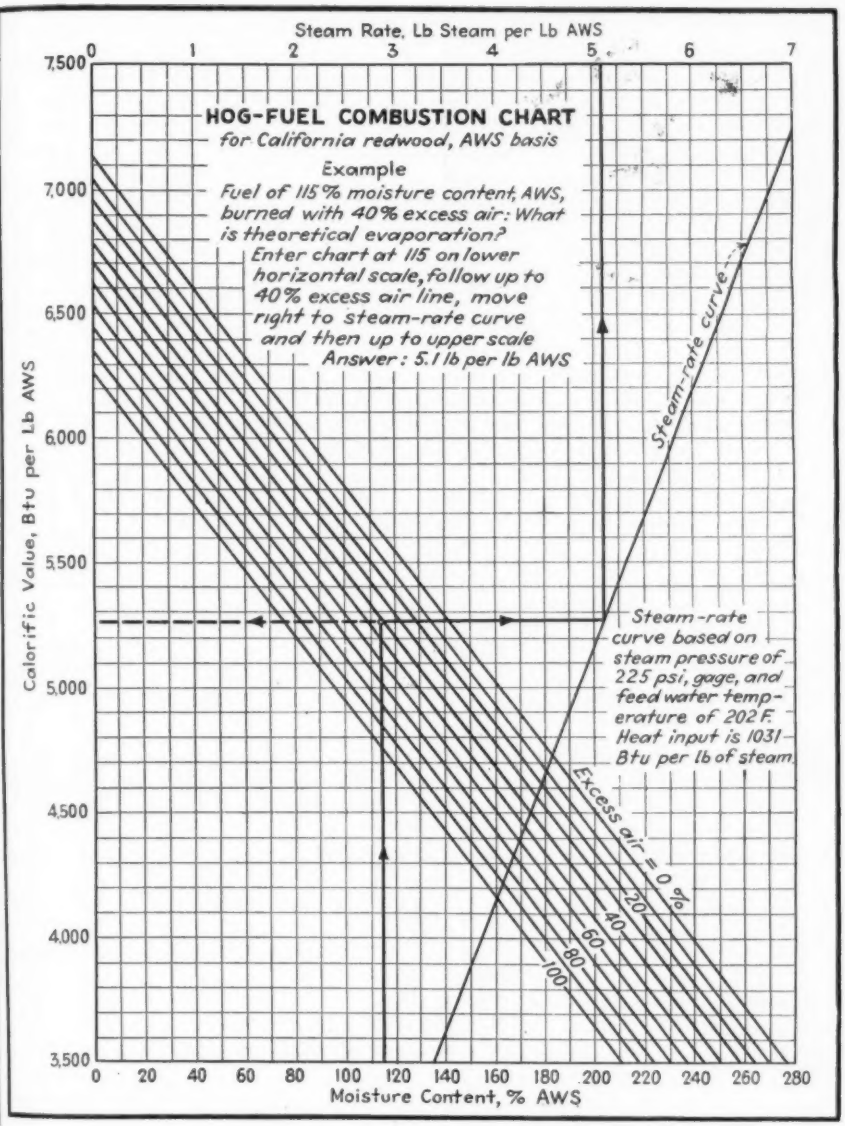
Theirs is a dramatic story, a story of cooperation and coordination . . . of ever increasing capacity on a shoestring allowance of new equipment.

For this is a war of movement. According to Joseph B. Eastman, Director of Defense Transportation, both the passenger and the freight traffic on the railroads is to a large extent war traffic – the transportation of troops and civilians on war business, the movement of food, raw materials and finished products required for the prosecution of the war. As Mr. Eastman put it, delayed arrival of troops at embarkation ports, delayed delivery of vital war materials could even conceivably mean the loss of men at the fighting front. And what Director Eastman says of the railroads applies to all forms of transportation. Transportation by bus, by street car, by truck, by train, by ship and by plane . . . all play a vital part in the achievement of victory . . . on the home front and on the fighting front which relies upon it.

*President, McGraw-Hill Publishing Company, Inc.*

# How to Figure Hog-Fuel Combustion

***G L Graiff shows the advantages of working on the AWS basis and carries through a calculation leading to construction of a handy chart***




## Perfect Combustion of Redwood Hog Fuel

| Component | Weight, lb | Required, lb $O_2$ | Required, lb Air | Products, lb $CO_2$ | Products, lb $O_2$ | Products, lb $N_2$ | Products, lb $H_2O$ | Products, lb Ash |
|---|---|---|---|---|---|---|---|---|
| Carbon..... | 0.535 | 1.425 | 6.170 | 1.960 | ..... | 4.745 | ..... | ..... |
| Hydrogen..... | 0.059 | 0.472 | 2.035 | ..... | ..... | 1.563 | 0.531 | ..... |
| Oxygen..... | 0.403 | ..... | ..... | ..... | 0.403 | ..... | ..... | ..... |
| Nitrogen..... | 0.001 | ..... | ..... | ..... | ..... | 0.001 | ..... | ..... |
| Ash..... | 0.002 | ..... | ..... | ..... | ..... | ..... | ..... | 0.002 |
| Total..... | 1.000 | 1.897 | 8.205 | 1.960 | 0.403 | 6.309 | 0.531 | 0.002 |
| Correction for oxygen in fuel. | ..... | 0.403 | 1.745 | ..... | 0.403 | 1.342 | ..... | ..... |
| Net total... | 1.000 | 1.494 | 6.460 | 1.960 | ..... | 4.967 | 0.531 | 0.002 |

▶ When expressing moisture content in terms of percentage, the lumber industry refers to the absolute or oven-dry basis. The wood-distillation industry refers to the same basis in calculating yields and calls it *Absolute Wood Substance*, usually shortened to *AWS*.

Expressing percentage moisture compared with absolutely dry wood offers several advantages. For example, in combustion calculations from an ultimate analysis, it proves simpler to start with one lb of absolute wood substance than with one lb of fuel as fired. Since moisture represents a loss, it can be carried as a subsequent item along with other losses. This simplifies calculations involving moisture differences.

Another advantage of the AWS basis lies in the ability to convert roughly from one unit of wood and lumber measure to another. For rough estimates in redwood, I use the following:

1 ton AWS=1 M ft board measure
1 ton AWS=1 cord
1 ton AWS=1 hog-fuel unit

Actually, on the basis of 23.5 lb per cu ft AWS, 1000 board ft equals 1957 lb AWS; at 86 cu ft solid per cord, a cord equals 2021 lb AWS; and at 10 lb per cu ft, one hog-fuel unit equals 2000 lb AWS. These figures are close enough to permit using the above simple conversion for all ordinary work.

This relationship varies with the wood species, and also within the species, especially the hog-fuel conversion. However, a similar conversion can be worked out for any wood. In the case of Douglas fir, for example, the figure becomes 1800 lb AWS.

Working out a typical combustion calculation from an ultimate analysis shows the advantages of using the AWS basis. According to Kreisinger, redwood hog fuel has the following ultimate analysis on the AWS basis:

| | |
|---|---|
| Carbon | 53.5% |
| Hydrogen | 5.9% |
| Oxygen | 40.3% |
| Nitrogen | 0.1% |
| Ash | 0.2% |
| | 100.0% |

Following standard procedure (See "Fuels and Combustion," Power, Dec.

(*Continued on page* 160)

# Engineers Offer Practical Help on Wartime Problems

***Feedwater, conversion, electrical distribution, piping, boilers, fuels and diesels discussed at Midwest Power Conference***

▶ EVIDENCING THE NEED for up-to-the-minute technical information to help solve wartime problems, more than 500 power engineers attended the Midwest Power Conference held at the Palmer House, Chicago, April 8 and 9. With Stanton E. Winston, Illinois Institute of Technology, as director, the conference was sponsored by the Institute with the cooperation of Iowa State College, Michigan State College, Northwestern University, Purdue University, State University of Iowa, University of Illinois, University of Michigan, University of Minnesota, University of Wisconsin, the Chicago sections of AIChE, AIEE, AIMME and ASME, the Illinois sections of ASCE and ASHVE, the Western Society of Engineers and the Engineers Society of Milwaukee.

Prof H O Croft, Iowa State College, opened the Conference. Following greetings by H B Gear, vice president of Commonwealth Edison, the national power situation was reviewed by C W Kellogg, president, Edison Electric Institute. Following are some high spots in abstract:

In 1941 I said power capacity of the country should be ample for war. This has proved correct, even though new capacity installed in 1941 and 1942 fell two million kw below my estimates.

Measured by government expenditures, our present war effort is over five times that of World War I, but there is no corresponding increase in load. Reasons include the substitution of war for peace activities, power pooling, longer work hours in industry and the change to standard wartime.

The annual load factor of public supply jumped to 58.4 percent in 1942, by far the highest on record. Compared with the highest previous load factor, this counts as 12.7 billion kilowatt hours made available without new equipment.

One must always remember that manufacturers make about ⅓ of their own power requirements, also that only 56% of the sales of electricity from the public supply were for industrial power in 1942.

The four million kw of new generating capacity scheduled for completion in 1943 should care for the nation's war requirements without cutting into reserves. Mr Kellogg concluded.

**Speaking on "Logistics—the Science of Survival," Col James L Walsh, chairman of ASME War Production Committee, told those attending the All Engineers Dinner that America's war effort is equivalent to the completion of one Panama Canal each day or one Empire State building each hour. He showed how entire populations become belligerents in modern war, and all production becomes war production. *Logistics* he defined as *getting the right amount to the right place at the right time*, as exemplified by the Allied invasion of North Africa. Here are some highlights of Col Walsh's address:**

**"The fate of civilization depends on our ability to mobilize, stimulate and effectively utilize all scientific, engineering, industrial, agricultural and business knowledge . . . Logistics is the business of buying unconditional surrender at the lowest possible cost in human lives . . . During three years of war the Axis has seized 2,648,000 sq miles of land and conquered 310,140,000 people . . . In war, when we save time we save human lives—half an hour's warning at Pearl Harbor would have saved half a billion dollars . . . In total war those who do not seek and find and perform positive activities to hasten victory are guilty of active assistance to the enemy . . . It is fitting to congratulate the engineers who have created and operated our great power pool; they have carried the burden of wartime peak load to the practically universal satisfaction of all those who depend upon them for power . . . We look to the power industry to redress the balance of our early losses in land area, natural resources and population."**

**At the opening meeting, left to right: H B Gear, vice-president, Commonwealth Edison Co, Chicago; H O Croft, State University of Iowa; C W Kellogg, president, Edison Electric Institute; M P Cleghorn, Iowa State College; Philip W Swain, editor, POWER; Stanton E Winston, Illinois Institute of Technology, conference director**

### *Practicality in Education*

Discussing "Practical Education in Wartime," Philip W Swain, Editor of POWER, said that the war is forcing educators to justify themselves by their accomplishments rather than by tradition.

## "We Want Fighting Engineers"

*A message to the Midwest Power Conference from General Charles Keller, District Engineer, U.S. Engineers Office, Chicago, Ill.*

"We want fighting engineers! We want the young, strong and fiercely willing men now being trained in every engineering college in the country. You have these men in your hands. Send them into any engineer office in the United States connected with our Division Engineer organization. We will pass on their qualifications. We will provide them with a letter to their induction station earmarking them for the Army's Corps of Engineers. Issue them our challenge.

"We are finishing up the biggest job of emergency construction the Corps of Engineers has ever undertaken. We've strung a bridge of airfields across both oceans and all continents. We've built a highway to Alaska toward the throat of Japan. Now we're going to do a job of construction overseas. We're helping move men and equipment into place for assault; and when the assault comes—then we'll start fighting.

"This then is our challenge to the youth in the engineer field and to you who can steer them into our team. What we want are men big enough to walk in and do the infighting, men who can place by hand the charges that will blow the Nazis apart once and for all.

"What do we offer? Dynamite—TNT for Tojo, high explosives for Hitler, flame throwers, bazookas, 30's and 50's. We offer a chance to build and fight . . . We offer a challenge no generation of American youth has ever failed to accept . . . We offer all the training they can take, all the plays they can learn, all the tricks they can use.

"Give us engineers; we'll make 'em soldiers."

In postwar education, he said, vocation should come first—such subjects, as reading, writing and arithmetic, plus those needed for specific vocations. Then should come studies needed for good citizenship—geography, history, civics, some economics, etc. All these studies are highly cultural as well as useful. After practical needs are met, students will still have spare time for such purely cultural studies as music, art and literature. Mr Swain predicted that postwar education will lay more stress on short simple books and practical shop work.

### *Light on Water Treatment*

Final cure of water troubles is always "just around the corner." But some progress was evident in the papers of Prof F C Straub, University of Illinois, and D B Jones of Hall Laboratories. Prof Straub's experiments suggest that silica and certain other solids are actually vaporized by high-pressure superheated steam. Thus solids carried to the superheater by entrained water may be "dissolved" in the high-temperature superheated steam and later deposited on the turbine blades by "sublimation."

Mr Jones says there is still no completely practical cure for silica scale in boilers. It costs too much to reduce the silica in the makeup water to very low proportions. The equally difficult alternatives are cleaning boilers frequently and keeping boiler ratings below the level at which trouble occurs.

### *Meeting Wartime Problems*

Several papers dealing with wartime problems offered many helpful suggestions. Lt Col A G Coulson, chief, Continuous Security Branch, Sixth Service Command, discussed "Wartime Protection of the Power Plant." He gave first place to fire prevention and protection. Fire is the most effective weapon of the saboteur because it leaves no evidence. Train employees to act promptly in case of fire or explosion. Systematically guard and restrict vulnerable areas; lock operating galleries and other control centers and allow only authorized persons to enter.

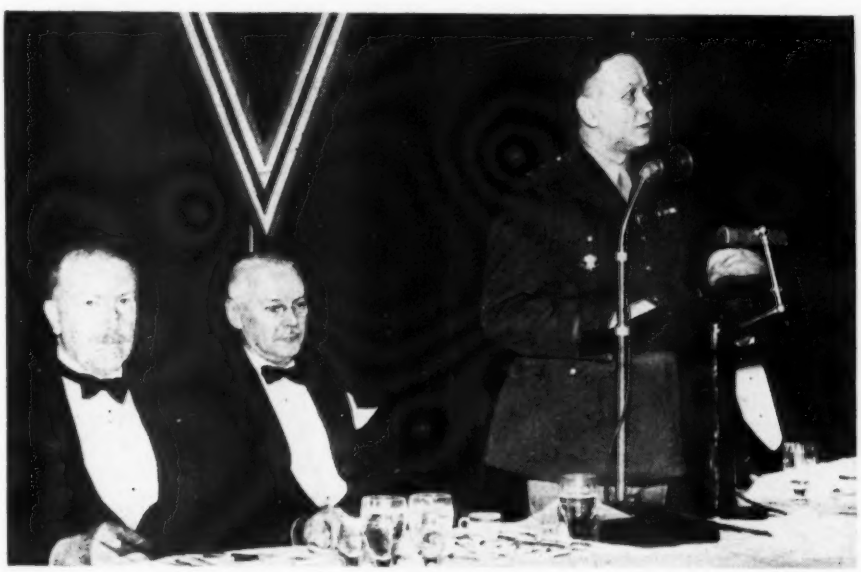
Many of the bottlenecks of wartime piping can be broken by resourceful engineers, according to G W Hauck, Crane Company, whose suggestions included the following:

To save steel use cast-iron fittings up to 250 psi and 450 F, but avoid cast-iron flanges on the ends of expansion bends. Keep specifications flexible. When you can't get welded joints use screwed joints, seal welded. Avoid ordering special fittings. Do part of the fabricating on the job. Make pipe bends do the work of special fittings. Don't insist on a globe valve when an angle valve will serve as well, or on a wedge disk, when only a double-disk valve is available.

Another wartime power problem—boiler maintenance—was covered by A C Foster of Foster Wheeler Corp. The first step in preventive maintenance, he said, is to discover what bottlenecks reduce capacity or efficiency and increase maintenance. Start with a complete performance test, determining pressures, temperatures, gas weights, etc, throughout. Next check individual boiler parts and auxiliaries.

Avoid flame impingement on furnace walls. Don't try to maintain high exit $CO_2$ with a leaky setting. Superheaters

(*Continued on page* 196)



**At the well-attended All Engineers Dinner, left to right: Col James L Walsh, chairman ASME War Production Committee and principal speaker; James D Cunningham, president, Republic Flow Meters Co and toastmaster; Major General Henry S Aurand, commanding general, Sixth Service Command, who introduced the speaker, Col Walsh**

# Locomotive Heats Hydro Plant

***S D Althouse, mechanical maintenance department, Safe Harbor Water Power Corp, shows how coal-fired boiler eliminated 75,000 gal annual fuel-oil consumption***

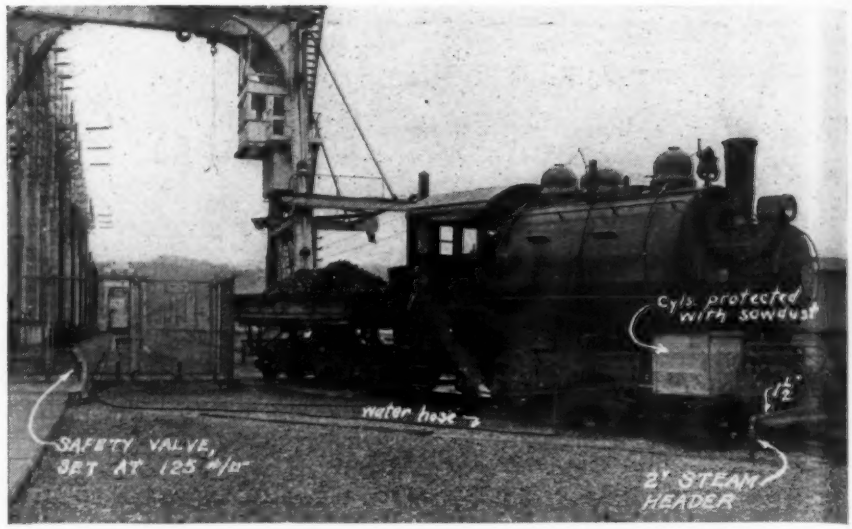



**Fig. 1—To save 75,000 gal of fuel oil, Safe Harbor plant and offices are now heated exclusively by steam from this yard locomotive**

► PROSPECTS OF FUEL-OIL RATIONING in the East and constant OPA warnings that heating consumers convert to coal were straws in the wind last year that led engineers at our Safe Harbor hydro plant to improvise an ingenious conversion. Someone suggested hooking up the steam locomotive to heat our buildings, and it turned out that this emergency arrangement kept plant and offices warm even in the coldest weather, with a yearly saving during the war emergency of 75,000 gal of much needed Bunker C oil. Here's how we solved the problem:

The generating station of the Safe Harbor Water Power Corp is one of three major hydroelectric developments of the lower Susquehanna, and is located at Safe Harbor, Pa., about 45 miles downstream from Harrisburg. It delivers much of its power to cities in eastern Pennsylvania, to Baltimore and Washington, and to the electrified section of the Pennsylvania Railroad.

Fuel-oil shortages confronted us with a problem because the boilers' fireboxes were designed to burn oil and could not easily be converted to coal.

Normal annual oil consumption runs around 75,000 gal for heating the plant, offices, shops, and store rooms. Although heating load is only about 4500 lb steam per hr, each of the two oil-fired boilers can deliver about 13,000 lb. This capacity is emergency protection for the water turbines of the main generators. The extra steam is used to combat frazil ice that forms in open water and tends to clog the turbines' water passages. Boiler capacity is sufficient to steam two turbines at once.

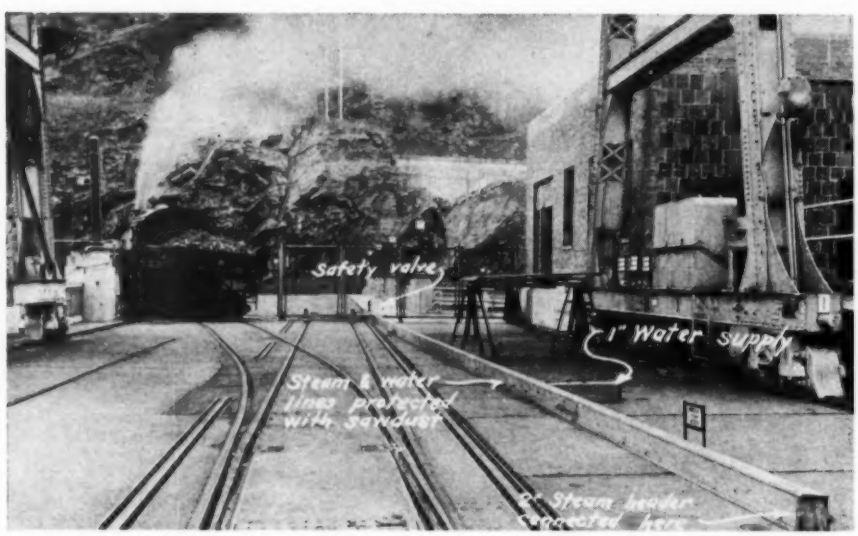



**Fig. 2—Locomotive supplies plant through 2-in. steam header which is packed in sawdust along with the 1-in. feedwater connection**

Although necessary for plant protection, this extra capacity makes for low operating efficiency at normal loads. Each of the fireboxes is equipped with two 40- to 60-gal-per-hr burners. Even in coldest weather, one boiler operating with a single burner easily handles the heating load.

First we considered hooking up the heating system to the steam-operated crane, then to the steam locomotive. Both were coal fired and available most of the time. The crane proved too small, so we moved the locomotive alongside the plant service building and hooked it to the heating system. This boiler—17,000-lb per-hr steam capacity—kept the buildings warm.

We assembled the connecting steam header from odd lengths of used 2-in. pipe and set a safety valve in this line to blow at 125 psi. Another line of used 1-in. pipe carried feedwater to the boiler. To prevent freezing, both lines were sawdust packed in the same wooden boxing. We haven't attempted to return condensate to the locomotive.

Similar sawdust insulation, in wooden boxing, protected both driving cylinders of the locomotive from freezing, and additional shelter was provided by a windbreak for the locomotive.

It takes only a moment to disconnect and run the coal car to the nearby pile for fuel. Last fall the locomotive was fired only in daytime. When necessary, during extreme winter weather, it was fired 24 hr a day. Naturally, the amount of heat to some areas was reduced very much below normal.

We estimate that cost of heating by this method, including additional attendants, will not be much higher than the normal cost with fuel oil.

# THE OPERATING ENGINEER

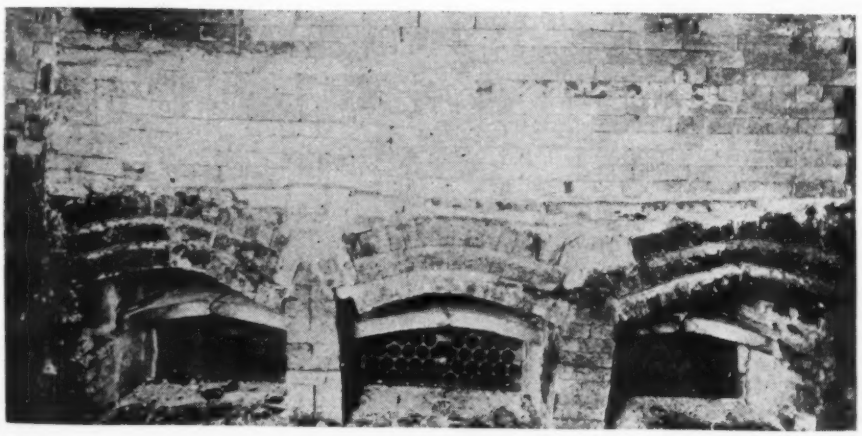
George Edwards *Advisory Editor*

PRACTICAL AIDS · MAINTENANCE HINTS · QUESTIONS — ANSWERS

PUBLISHED MONTHLY AS AN INTEGRAL PART OF POWER

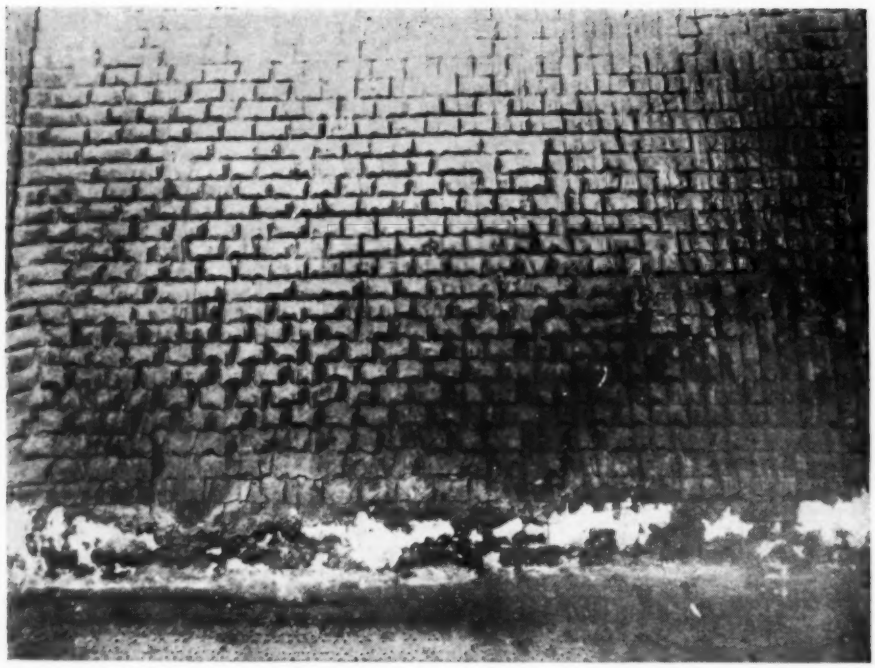

# Furnace Walls Are Temperamental

***In long years of furnace design and construction, George P Reintjes, of Kansas City, Mo., has had a chance to see most of the right and wrong ways of doing a job. These are his photos taken in the field, and the comments are based on his notes***

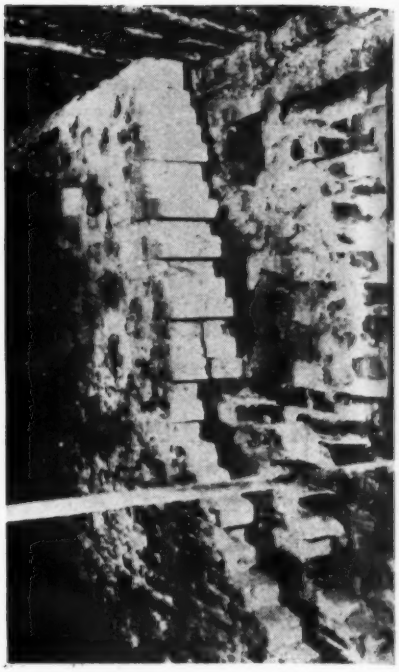


**Heat plus load** spells wall punishment for furnaces. Any refractory subjected to heat becomes plastic. The heavier the loading the lower the temperature at which the refractory is deformed by the combination of heat and pressure. In the example pictured, designer and builder apparently expected that the piers between gas burners would carry the full weight of the rear wall of ordinary brick construction. Subjected to high temperature, the piers sagged under the load, allowing arches to settle and the wall to move in about four inches. Moral: avoid concentrating heavy loads on lower heated sections

**Cheap masonry costs more.** This photo, taken after the steel front had been removed, is a view toward the furnace. When the owner of this plant put in a new stoker it failed to perform as promised so that the boiler couldn't handle the load. Because of this both stoker and boiler were blamed and the stoker was replaced with another unit. A post mortem showed that the masonry was the real culprit. Note the results of poor workmanship, particularly the bricks the mason left in the air passage. These choked the supply of air to the stoker, thereby reducing its capacity and causing its rejection. This shows how lack of skill or a sense of responsibility can start a chain of trouble and needless expense. Mr. Reintjes has observed many jobs of this sort

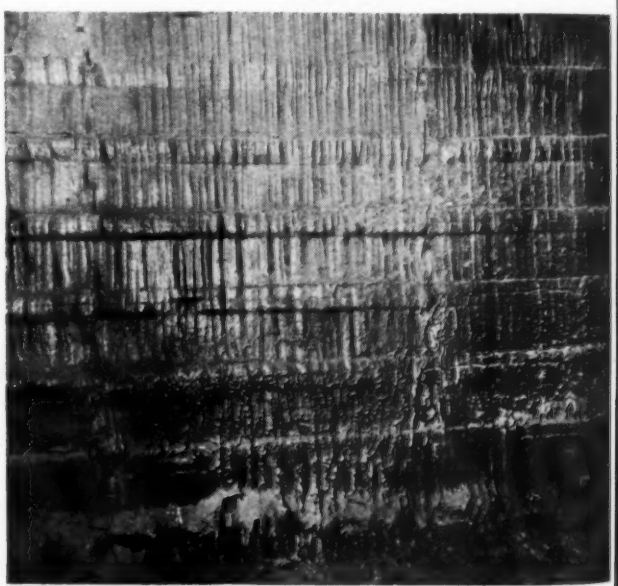


**Cumulative effect of pressure** is clearly shown in this photograph. Each successively lower row of bricks carries more load than the one above and shows correspondingly more disintegration, except at the very bottom where deposit of slag and ashes protects the refractory from extreme heat. If the wall had been sectionally supported on the steel work, so that none of the refractory carried heavy load, this cumulative effect could have been avoided



**This separation** between inner and outer furnace wall almost always protects outer wall from cracking. Inner wall should invariably be built so that it expands and contracts independently of the outer furnace wall

**Massive tiles were first used** for headers by this purchaser in an unsuccessful attempt to prevent wall separation. His plan failed; note the sheared headers. He then attempted to air cool the inner refractory, using hollow bricks. The type of construction is effective if you can prevent excess air filtering through the thin tile walls into the furnace. This same furnace included an outstanding defect (not shown)—columns set within a solid wall of refractory. Columns thus placed soon oxidize and corrode, heat and become distorted, so that the walls are bowed outward. Regardless of circumstances, no steel of any description should ever be embedded within any heated refractory wall



**In a well-designed supported wall,** the refractories are protected from heavy load and thus can be heated almost to the melting point without detrimental deformation. Here, the sectional, supported wall has worn away from 9 in. thickness to 5 in. without deformation. In this wall, wear was delayed by alternating standard firebrick with tile. Photo shows that the brick is somewhat more retardant than the tile and will delay the wear of the entire wall, as well as reduce the first cost. Here, each section has expansion joints at fixed intervals around the four sides. Tiles and intermediate brick are fused together with air-setting high-temperature cement. This furnace burned pulverized petroleum coke

**REFRIGERATION NOTEBOOK — 2**

# Safe Working Methods Lick Plant Hazards

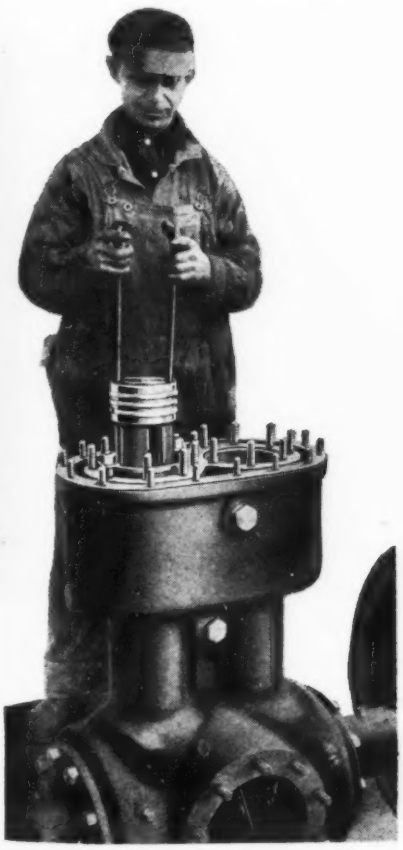
By TERRY MITCHELL, ME, *Frick Company*

▶ HERE ARE A DOZEN safety rules that help refrigerating-plant operators cut accidents and waste.

Always pull out the main-line switch to clean, adjust or repair equipment that starts under automatic control.

Wear goggles when repairing a system containing gas under pressure, or the eyes may freeze on contact with liquid Freon, which is otherwise harmless. Wear gloves and have a bucket of water handy when working with liquid ammonia.

Normally there is some pressure on both sides of a safety valve connected into a bypass manifold. Closing the nearest compressor stop generally does NOT isolate the relief valves. Therefore, when stopping a leak, you may have to pump out the lines or blow out the pressure through a flange. Similarly, when the main stop valves on most modern ammonia compressors are closed, pressure from suction or discharge pipes remains on the backs of the valves. Before opening a valve for regrinding, pump or blow out the line. However, by opening back-seating valves all the way, you can repack them at the stem while under pressure.



**Insert the piston-ring guide in place of the safety head before removing a piston to avoid piston-ring breakage**

Nearly all ring breakages can be prevented by putting the piston-ring guide or sleeve in position before removing or replacing a piston. Rings tend to spring open, get off center and catch on the projections that guide the safety heads, just above the cylinder.

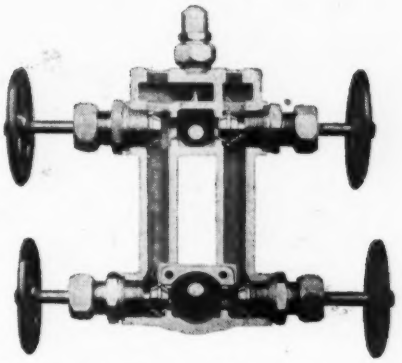
Do not use a refrigerating machine for pumping an air pressure on the system when you are, for instance, testing for leaks, unless the compressor cylinders are water jacketed. Test with carbon dioxide, later adding a little Freon-12, or use air pressure from a high-pressure machine having a water jacket. Pump the air pressure slowly, about 25 psi at a time, letting machines and valves cool between runs. Otherwise, the machine's temperature may rise above the oil's flashpoint, injuring valves or causing an explosion.

### *Keep Flame from Freon-12*

In the presence of a flame or sufficient heat, Freon-12 releases poisonous fumes. Therefore clear it from pipe lines before welding or soldering, and blow out the lines carefully before connecting them to the system again. Don't light a Halide torch in a room filled with Freon fumes.

Ammonia, oil and heated air may form an explosive mixture in testing old pipe systems with air under pressure. First drain and blow out the lines. If all the ammonia or Freon-12 must be pumped from the high-pressure part into the low side to get at a leak, do not let pressure in coils or coolers rise above a safe limit, say 150 pounds.

Corrosion eats away brine lines, pumps, coolers and ice-making equipment. Before they break down, study the problem and treat the brine. A mixture of dissolved carbon dioxide and oxygen has lately been shown to be 10 to 40% more corrosive than their sum when acting separately. The American Society of Refrigerating Engineers issues "Corrosion Data Bulletin No. 10," one of several good publications.



**Section of the manifold of a modern enclosed ammonia compressor shows how pressure remains on safety valve even though the stop valves are closed**

Other causes of slow but serious injury are uneven settling of foundations, leaks (and wrecks) caused by vibration, heavy overloads, too frequent starting and stopping, entry of water or brine into the system, unintentional operation under vacuum, clogged water jackets, stray electric currents and choked oil lines. Besides routine cleaning and rerolling of tubes, tightening and aligning of V-belts, and yearly overhauling of machines, watch for small defects that may cripple an entire plant.

All automatic equipment demands skilled attention periodically. Too small an opening in an automatic expansion valve is treacherous in Freon systems, especially if the valve is at the top of a long riser, where the weight of the liquid partly equalizes the pressure in the receiver, because Liquid Freon-12 is more than twice as heavy as liquid ammonia and the condensing pressure is much lower.

Along with oil, refrigerant, packing, gasket material, etc, keep on hand spare parts that wear or corrode. It's interesting to know that you can safely apply ammonia valves and fittings to much higher pressure jobs than are ordinarily encountered in refrigeration work, provided temperature is within reason and packings are suitable. The smallest ammonia valves and fittings can handle pressures up to 1200 psi.

# PRACTICAL AIDS TO OPERATION

## Inspecting and Filing Instrument Roll Charts

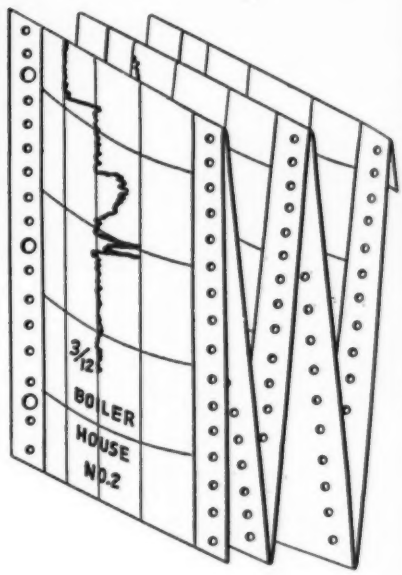
A ROLLED STRIP CHART from a recording instrument often presents an awkward problem for the plant manager or office engineer who only occasionally handles this type of record for inspection or as part of a report. Operating men who inspect charts regularly usually have a place or device to facilitate such inspection and by everyday familiarity may have acquired an advantage over persons not accustomed to rolling and re-rolling these records.

Inspection of a roll chart on a desk top can be greatly simplified if the chart is unrolled and flattened bookwise into 11.5-in. lengths with the printed side out, as in the photo and diagram. The chart may then be spread on any desk or table and turning the folded pages from right to left reveals the undisturbed continuity of the chart. Any section of the chart is found quickly because it has been broken into short lengths.

Punching standard 2- or 3-ring binder perforations in the edge of the folded chart allows convenient filing in a notebook or file folder so that the chart is ready for quick reference in a pattern conforming with generally accepted office practice.

This is a simple practice which can be a timesaver, useful for encouraging inspection of records by individuals who ordinarily will avoid the more cumbersome rolled chart.

*East Alton, Ill.* EDWARD F WEHLAGE




## Oversized Foot Valve Causes Lots of Grief

WE HAVE IN OUR PLANT three 10,000-gal fuel-oil tanks under the boiler room floor, which have the usual fittings for suction, filling, heating lines, sounding pipes and a small hand pump, the latter to draw water from the bottom of the tanks. Recently one of the hand pumps failed to function when the fireman operated its lever. When we disconnected this lever we found that the piston rod could be pulled out of the pump, showing that the piston was detached. The pump cylinder and top cylinder head were cast in one piece, making it necessary to remove the cylinder from the tank to retrieve the piston—work that could have been avoided by proper design of the pump.

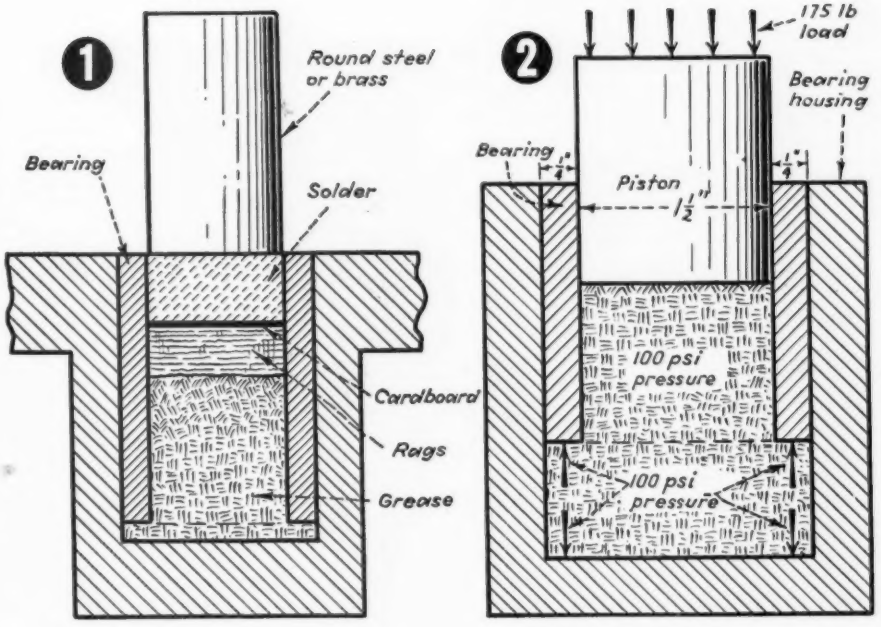
To remove the pump cylinder we had to cut through 3 ft of concrete, dig out 12 in. of sand and then cut through 12 in. more of concrete around the tank. We then unbolted the pump from the tank and started lifting it with a chain fall. When only about 4 in. of the pump cylinder remained in the tank we heard a clang of metal to metal and discovered that the foot valve was too large to pass through the opening in the tank. This made it necessary to enter the tank through the manhole and remove the foot valve, about 1.5 in. larger than the hole in

the tank, a size that never should have been installed.

We found that the pump piston had been fastened to its rod with two nuts which had rusted off. We replaced the old piston rod and shrank the piston on it. Before installing the pump again we checked in several valve manufacturers' catalogs and found that they all listed foot valves that would pass through the pump opening in the tank. We therefore obtained one and installed it on the pump.

Why the designer selected the larger foot valves and the pipe fitter who installed them permitted this error to occur will be beyond the practical minds of most operating engineers. Also, there is no good reason for not building the pumps with a removable top cylinder head so that their pistons could be removed without taking the pumps from the tanks. Will designing engineers never learn that equipment must be operated, and try to make it easy to inspect and maintain?

*New York, N. Y.* TYLER G HICKS




## Grease Piston Removes Tight Bearing

WE WERE FACED with the problem of removing a large sleeve bearing without damaging it from a housing open at one end only. One side of the bore in the bearing had become so worn that the machine, of which the bearing was a part, could not be operated. If the bearing could be turned 180 deg it would be almost as good as new. Before the bearing could be turned this amount it had to be removed from its housing. The bearing could not be driven out because it was in a blind housing and the housing could not be turned 180 deg so we solved the problem as follows:

First we placed the blind end of the housing on a flat solid surface and then filled the bearing about two-thirds full of grease. On top of the grease we packed in a layer of rags with a cardboard disk on top. We then filled the remainder of the bearing with molten solder to act as a piston on the grease, Fig. 1. With a round piece of steel slightly smaller than the bore in the bearing and a heavy hammer we drove the solder down into the bearing. This pressed the grease up against the lower end of the bearing with sufficiently high pressure to force it out of the housing.

Some readers may be in doubt as to how this idea works, but it is only a simple problem in fluid mechanics. This is shown in Fig. 2. The bearing shell is ¼ in. thick with a 1.5 in. bore giving the bearing an outside diameter of 2 in. A circle 2 in. in diameter has an area of approximately 3 sq in. and a circle 1.5 in. in diameter has an area of 1.75 in., the cross-sectional area of a snug fitting plunger to go into the bearing. Then the end of the bearing has an area of 3 − 1.75 = 1.25 in. If we put a load of 175 lb on the plunger,

## Stainless-Steel Sheet Makes Oil Drops Visible

IN ONE PLANT WHERE I worked illumination was poor around a group of oil sight feeders on each engine. These feeders needed frequent attention and required the use of a flash light to make sure that oil flowed properly. To remedy this condition I installed a sheet of stainless steel in back of each bank of sight feeds, as in the diagram. Each sheet was placed so that it could be easily removed for surface cleaning.

After the sheets were installed, instead of the black background of the engine housing completely camouflaging the oil drops, the stainless-steel bright mirror-like background made the oil drops easily visible. Since making this installation I have used this method in other plants with good results.

*Great Neck, N. Y.* S M ELONKA

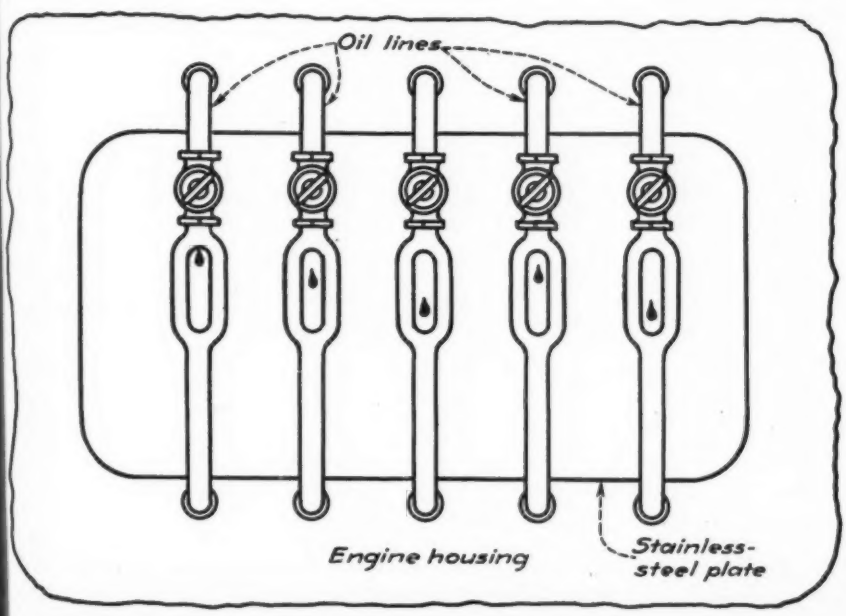
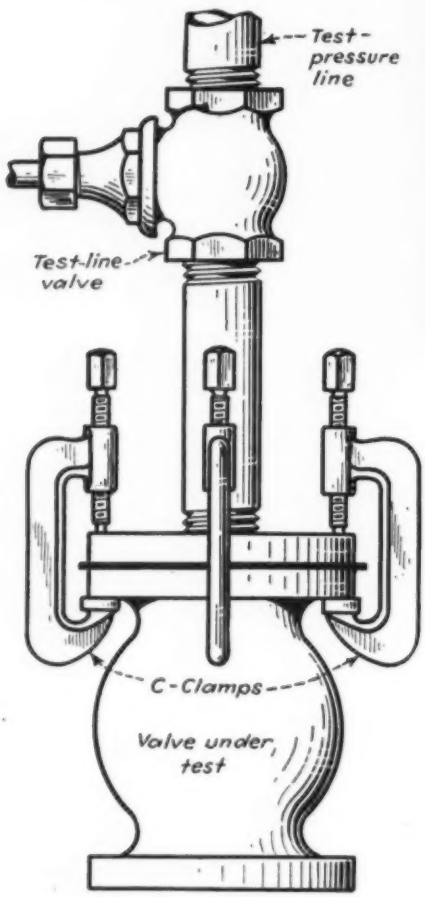


Fig. 2, this will be equivalent to 100 psi to compress the grease in all directions. Since the end of the bearing has an area of 1.25 sq in. a total pressure of 100x1.25 = 125 lb will act on it to force the bearing out of the housing.

*Brooklyn, N. Y.* G STERLING GRAVES

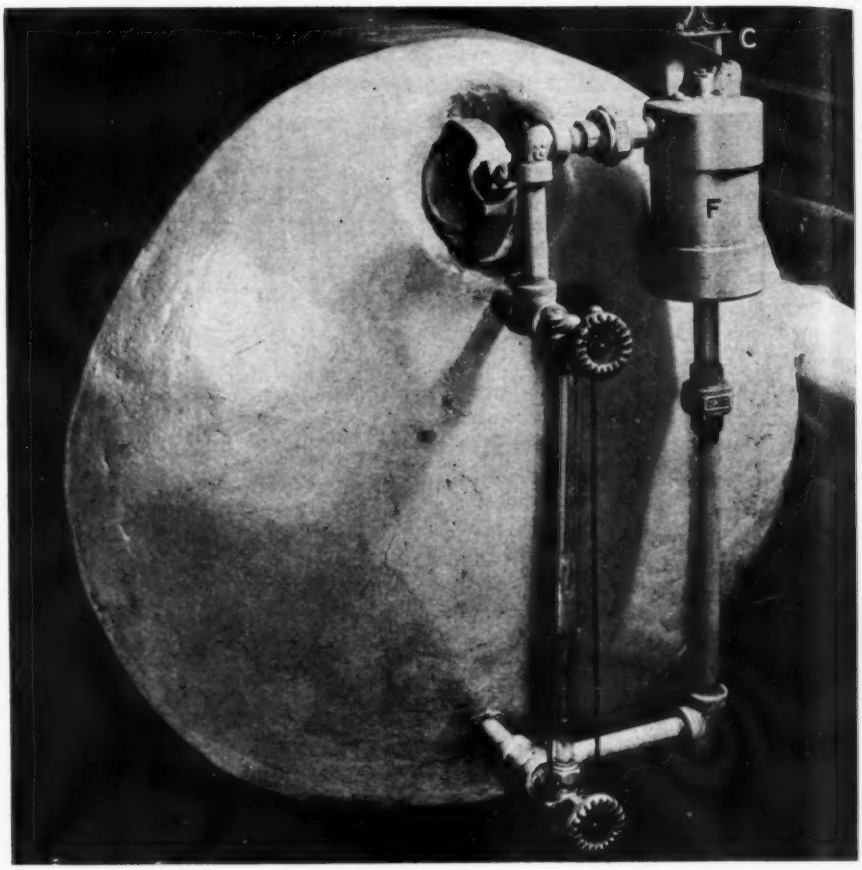
## Check Valve Tightness Before Installation

VALVES, PARTICULARLY OLD ONES, should be tested before being installed. Too frequently they are overhauled and put back in service, and leak immediately. In one plant where I worked all valves were tested for tightness before being installed. For the tests, we made a connection about 10 ft long from the feedwater line with a valve near the outer end of the connection.




This long connection gave us fairly cool water for testing at boiler pressure of about 200 psi. For the end of this pipe, we made various fittings—one of which is shown in the figure—to which to attach the valves to be tested. If we wished, we could first test the valve on cold water, next drain the line by opening the valve until hot water flowed and then close the valve to see whether it remained tight when hot.

*Great Neck, N. Y.* S M ELONKA




## Condensate-Tank High-Water Alarm

A DEPENDABLE SIGNAL system relieves the operating engineer of a lot of worry, for that reason we are strong for signals in our plant in the Washington Life Building. Condensate from our heating system comes into a return tank from where it is pumped to the feedwater system. This tank vents to the free exhaust line running to the building roof, outside the backpressure valve.

On one or two occasions the pump failed to start when the float switch on the condensate tank closed. As a result condensate backed up through the vent pipe and into the free-exhaust line before it was discovered that the pump was not running. To prevent this happening I made a high-water signal system and connected it in between the gage glass and the tank as in the photo.

The actuating part of the signal system consists of a vertical operating float *F* that closes two electrical contacts *C*. These contacts, when closed by the upward movement of the float, complete the circuit to a bell and battery.

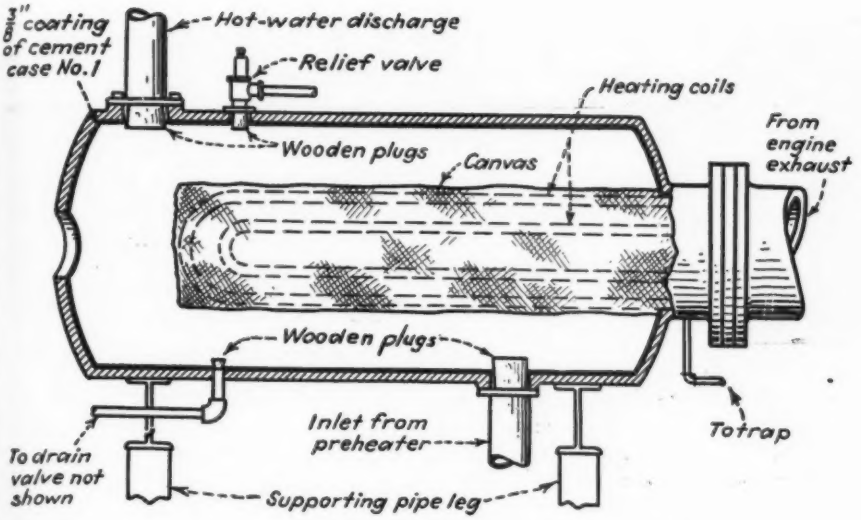
The float is set to close the alarm circuit when the water in the tank rises 8 in. above the level at which the condensate pump should start. This gives plenty of time to do something to correct the condition if the condensate pump fails, before the tank overflows into the free exhaust, flooding it and causing an excessive backpressure on the system.

*New York, N. Y.* ALBERT FISCHER

## Preheated Air Solves Heating Problem

IN A LARGE INDUSTRIAL plant a novel solution was found for an otherwise difficult heating problem in a wash and locker room remote from suitable steam or condensate return lines. In this plant the preheated-air duct connecting to the boiler and supplying hot air to the pulverizer passed near the wash room. Because of the cost of extending suitable steam and condensate-return lines to this room a connection from the preheated air duct was made into it and connected to a hot-air heater. A damper controlled hot-air flow to the heater.

*Chicago, Ill.* R C HENDERSON




## Protect Heater Before Applying Protective Coating

WHEN WE OPENED one of our water heaters for laundry service we found evidence of serious rusting. After removing the rust from the affected areas and cleaning the heater, we gave the inside of the tank a 3/8-in. coat of special cement. Before doing the job we carefully wrapped the heating coils in old canvas to keep their surfaces clean. In addition, we closed all inlet and outlet openings with wooden plugs to prevent dirt getting into the pipes. As a result, when the job was completed and the protective devices removed, heater coils and pipe connections leading into the tank were clean.

*Fairview, N. J.* MARTIN N GOZDENOVICH

## Plastic Disks Safeguard Pressure Gages

A SERIOUS DANGER exists wherever gages operating at high pressures are equipped with glass faces. Should there be a rupture of the bourdon tube the gage is likely to explode and throw shattered glass throughout the surrounding area. If this occurs persons in the vicinity may be seriously injured.

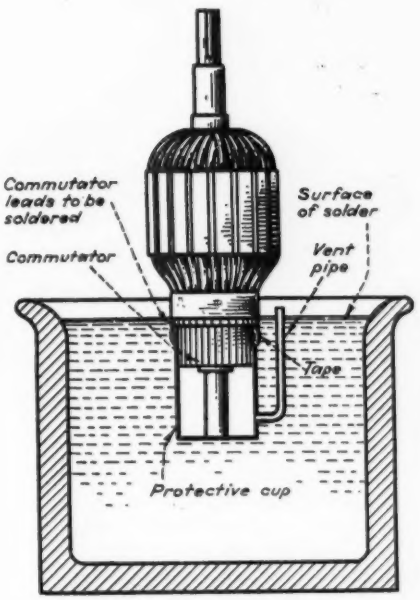
Much of the danger of flying glass can be eliminated by substituting faces made of transparent plastic. In fact plastic faces on any gage will usually prove to be a paying investment since this material will not crack when the face ring is tightened and can withstand heavy mechanical blows or other forces without injury.

*Staunton, Va.* S H COLEMAN

## Sleeve Prevents Dip-Soldering Spatter

A SIMPLE BUT EFFECTIVE protective cup devised by Donald Butter, a plant engineer, General Electric's Schenectady Works, prevents molten solder from spattering on the operator or adhering to the body of the commutator or shaft when dip-soldering leads of small generator and motor armatures into commutator segments. This cup, formed of sheet steel with welded joints, has a piece of 1/4-in. pipe welded into its side near the bottom that extends up high enough to protrude above the solder when the commutator is submerged, as in the figure. This pipe acts as a vent to carry off any steam or vapor that may generate when cold metal is submerged in the molten solder.

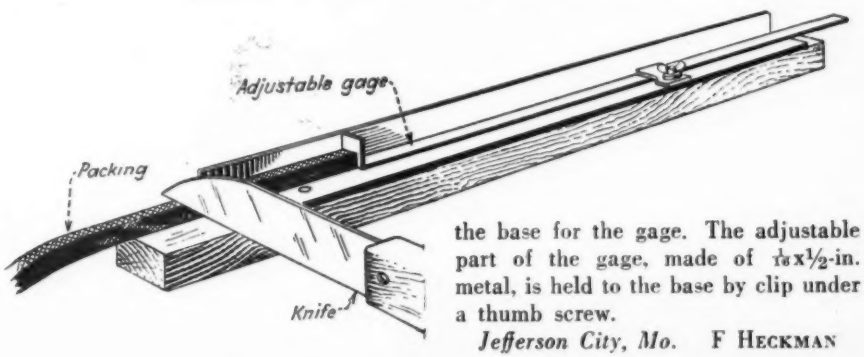
Made with a slide fit the cup covers the shaft end and about three-quarters of the commutator body. Taping the joint between the commutator body and the cup seals it to prevent the entrance of molten solder. Suspended vertically on an electric hoist over the solder pot, the armature is lowered until the commutator with sleeve assembled is completely submerged in molten solder, covering the slots and lead ends. The




rotor is left in this position until the leads thoroughly sweat into the slots, then it is hoisted. The sleeve is easily removed with asbestos gloves, and the rotor placed on a table to cool.

## Gage Cuts Packing to Correct Length

ANY MECHANIC who is particular wants each ring of packing cut exactly the right length when he is doing a packing job. The easily made packing gage shown in the figure has been in use for several years. With it, once the correct length of the first ring is determined, each succeeding ring can be cut that length. A piece of 3/4x1-in. pine, mounting a 3/4x1-in. angle, 3/32-in. thick, forms




the base for the gage. The adjustable part of the gage, made of 1/8x1/2-in. metal, is held to the base by clip under a thumb screw.

*Jefferson City, Mo.* F HECKMAN

# READERS' PROBLEMS

## *Questions from Our Readers*

### How Do You Test Fuses?

#### *Question 1*

WE WOULD LIKE *to have the opinion of* POWER *readers as to the best methods of testing different-sized fuses in electrical circuits.*

*Our main distribution is at 13,000 v, being stepped down to 2300, 440 and 220/110 v for power and lighting. With so many different-sized fuses, is it possible to use the same device when testing all of these fuses?*

*When a bad fuse is suspected in a polyphase motor circuit, can the fuse be tested in place or must it be transferred to a separate potential?*

*I understand that the ordinary bell and battery or lamp arrangement might blow an otherwise good 13,000-v potential transformer fuse. If this is the case, what method can we use?*

*On lighting cabinets with one side grounded, is the test dependable when the probes are placed on the cabinet and live circuit? What methods are most dependable?—RJ*

### Disconnecting Switches

#### *Question 2*

WE HAVE A LARGE NUMBER *of single- and double-bladed copper disconnecting switches inserted in equipment leads on each side of the respective oil circuit breakers. Some of the switches are in the powerhouse while others are exposed to the weather.*

*These disconnectors have caused considerable trouble by cutting and dragging metal at both the hinge and clip.*

*Since this cutting causes a high resistance and consequent heating, the switches must be dismantled frequently and refaced. This practice causes inconvenience because of the amount of equipment which must be removed from service. Is there any safe method of testing these disconnectors for heating, while normal load is being carried? Bus potential is 13,000 v.*

*What is the best method of resurfacing these switches? What lubricant stands up best on this indoor and outdoor service?—NAK*

### Artificial Loading of Alternators

#### *Answers to March Question 1*

#### *The Question*

IT MUST BE A COMMON OCCURRENCE *these times for engineers to be called upon to arrange artificial loading for large natural gas and diesel engines in order that heat-balance figures and performance data be determined on the site, particularly with units erected overseas; and I am sure it would be of considerable interest to see how engineers overcome this difficulty.*

*In our particular case it will soon be necessary to load a 1500-hp natural-gas engine driving a 1000-kw 2300-v 3-phase generator. A similar unit has already been installed; this was loaded by a water resistance which proved unsatisfactory.*

*In Great Britain 500 volts dc is regarded as about as much as can be safely used when loading by water rheostat, and this is invariably used for testing at the docks where there is an abundance of water. It is not convenient to load our machine from the panel, although it is thought loading may be possible by motoring some small emergency 300 kw diesels; by virtue of the panel layout and the obvious limitations of this method it has not been seriously considered.*

*I am also familiar with loading by resistance elements using a fan for dissipation of heat. This for a single unit is expensive, even assuming resistance wire could be obtained. However there are undoubtedly engineers who have overcome this problem and I would appreciate hearing what methods were used.—CEJ*

### Water Rheostat Construction

MOST HIGH-VOLTAGE WATER RHEOSTATS are used in fresh water, and an arrangement that gives excellent service in one stream may be a total failure in another. Experience has divided these temporary water rheostats into two classes—high and low voltage; 2300 v and under require some kind of tank as water must be salted. It is difficult to balance the load on several water barrels in multiple. First one and then another barrel heats up, grabs the load and boils over.

An average load of about 200 amp can be handled continuously on a barrel rheostat, and 400 amp for a few minutes. Two or three barrels can be used in multiple without a great deal of trouble; four or more are unwieldy and hard to handle.

Barrel rheostats can be made by putting a flat iron plate in bottom of barrel. The wire lead is brought up side of barrel and covered by a wooden strip to prevent contact with the movable

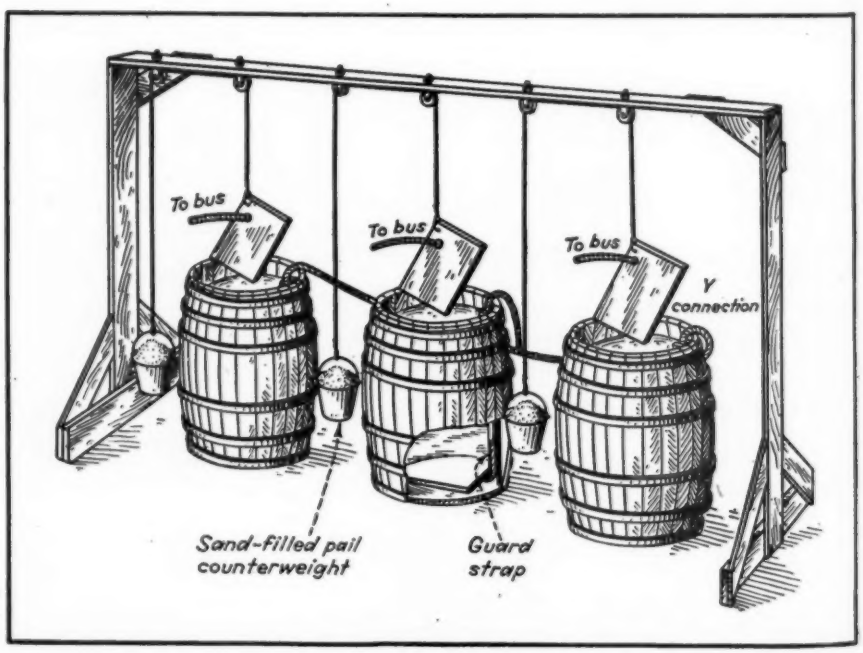


plate. The upper, or movable, plate should be rectangular or triangular in shape, hung so that a corner will enter the barrel first.

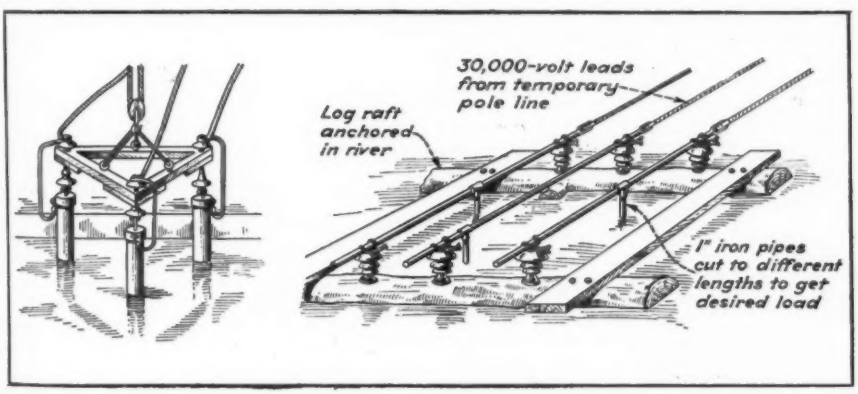
Contact of the plates, of course, causes a short circuit, which can be prevented in several ways, three of which are: a lattice grating over the lower plate; a short length of rope tied securely to the upper plate and to some part of the head support; or the counterweight attached so it will strike the first pulley. In 3-phase circuits the barrels should be Y-connected by tying the bottom plates together. Insert a strain insulator of suitable voltage in the operating rope.

Water temperature, the kind and amount of mineral salt in solution, or even the amount of mud in suspension —all affect the problem. An arrangement that has worked satisfactorily on 30,000 v in several mountain streams has failed utterly when tried on 2300 v in a stream carrying mineral salts.

*Chicago, Ill.* R O SMITH

## Obtaining Test Load

PERHAPS CEJ can use one of these water rheostats which were successfully used for testing 3-phase generators. The first plant tested was a steam-turbine station having four 2500-kw 2300-v 3-phase generating units, with voltages stepped up to 22,000 v for transmission by means of transformers having windings taps for 11,000 v.


30,000-volt leads from temporary pole line
Log raft anchored in river
1" iron pipes cut to different lengths to get desired load

A wooden framework of equilateral triangular form with sides 3 ft long was constructed. At each apex, standard pin-type line insulators were mounted to provide means for connecting the line conductors. Three electrodes, each consisting of sections of 4-in wrought-iron pipe 8 ft long, were attached to under side of framework by means of suspension insulators and connected by short leads to the line.

Full load at 11,000 v was obtained with about 6 ft of the electrodes immersed, and fractional load could be obtained with exactness by adjusting depth of submergence.

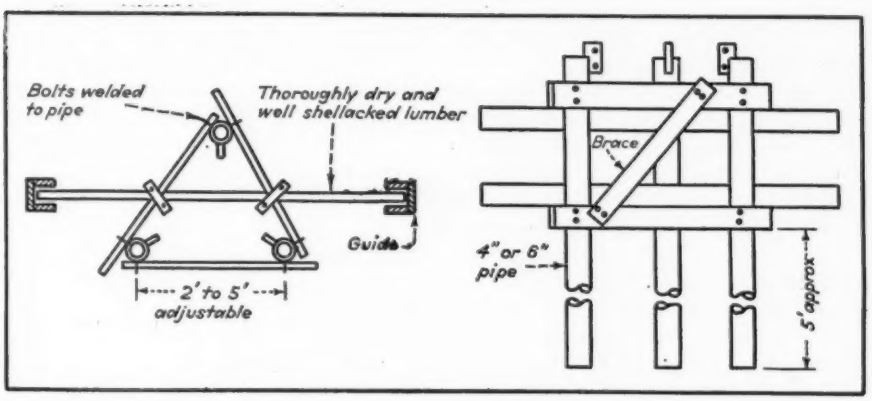
Later on, two 3125-kva 2300-v 3-phase hydro units were tested. Tests made on the first plant suggested the possibility of testing these units at the lower voltage of 2300 v. From preliminary tests it appeared that about 28 sq ft per phase per electrode would be sufficient if electrodes were located on 4-ft centers.

Another hydroelectric plant having four 4000-kva 2300-v 3-phase generators was tested at 33,000 v. In this case, the loading device was placed out in the river where the water was 20 ft deep with a flow velocity of 10 to 15 ft per sec. A log raft anchored in place by cables fastened on both sides of the river proved a suitable loading device.

Across three pairs of line insulators on the raft, three pieces of 1-in. iron pipe, flattened at one end to receive the line connector, were laid and tied in place. Each pipe was made up with a tee inserted at a point that would place the three 1-in. legs in the water at the corners of a 6-ft equilateral triangle.

Three lengths of pipe were screwed into the tee connections, leaving 3½ ft of electrode immersed. Performance was entirely satisfactory, for the load was constant in spite of a considerable amount of boiling at the electrodes.

*New York, N. Y.* L C RINEHART




## Suggests Water Rheostat

A WATER RHEOSTAT is the most suitable method of testing large alternators when it is impossible to use part of the plant load. Successful tests of over 30,000 kw at 13,800 v have been made. The main difficulty comes from water turbulence caused by gassing and boiling at the electrodes.

Major requirements in building a water rheostat are sufficient cooling, strength and stability of electrode structure, protection of operators, and exclusion of foreign objects.

Running water provides the best cooling. If a cooling pond must be used, the water must be circulated past the electrodes. When a tank is used, the incoming water should come in from the bottom and circulate up past the electrodes. Steel makes the best tank. If a wooden tank is used, there should be a large steel plate in the bottom and several hoops around the inside; all hoops and the bottom plate should be securely connected to each other and to the station ground.

Electrode structure must be mechanically strong and should be held by a guide so electrodes will be held steady in spite of gassing (sketch above).

Connect all metal work in the vicinity of the rheostat to the station ground. This grounding cable should have a continuous carrying capacity of at least half of the generator current. Place insulators between electrodes and hoisting rope.

Eight-foot lengths of 4- or 6-in. iron pipe, arranged for immersing up to 5 ft, should make suitable electrodes for a 1000-kw unit. Arrange these on the points of an equilateral triangle in a well-shellacked, dry, wooden framework. Make the framework so that the electrodes are 2 to 6 ft apart, the larger distance being suitable for salted or brackish water. Suspend the rheostat by a three-point sling from some convenient scaffold or outrigger. Attach cable leads securely to the electrodes so

as not to interfere with raising and lowering the frame.

If open water is not available, use a watertight tank eight or ten feet in diameter and about five feet deep. Stops must be arranged so that electrodes cannot touch steel at the tank bottom or swing into steel at the sides. Pump in cooling water at such a rate that the temperature will be 190 F or lower. Determine amount needed on the basis of allowable temperature rise and load to be dissipated. A salt solution can be bled into the tank if it is needed to carry the required load. For safety, a drain near the top of the tank must keep it from overflowing.

*Knoxville, Tenn.* JAMES WILSON

## Use Plant Load

Water resistance, as CEJ pointed out, is unsatisfactory, and motoring emergency units would not produce the necessary results. As a prony brake is out of the question, the best method would be to use the alternator in conjunction with resistors. The remaining possibility would be to use the plant load.

Shifting the load to the particular unit under test will not be a difficult problem.

*Schenectady, N. Y.* CARL BACHMANN

## Large Variation in Water Resistance

INFORMATION IS AVAILABLE describing tests that have been made up to 13,200 v. Actually, most rheostats have been built by cut-and-try methods for each particular job. Specifically, three 1-in. pipes attached to insulators and suspended from an adjustable rack, which can be raised and lowered in a running stream, have taken care of a 2400-v, 3000-kva 3-phase unit. However, the great variation in water resistance, which may vary 150%, influences pipe spacing, which in one application was 6 ft and in another about 4 ft.

Actual information about this equipment is contained in a comprehensive article, with bibliography, in the *Electrical World*, July 17, 1937.

*Brooklyn, N. Y.*
C O VON DANNENBERG

## Steam-Generating Element

THE SIMPLEST AND CHEAPEST method of providing a load of the size required by CEJ would be with the type of element widely used for electric steam generators. If a pressure drum is available, operating at low pressure and blowing off steam to atmosphere would use only a small quantity of water. If steam is objectionable, increasing water quantity and recirculating to a cooling tank will allow operation without a pressure vessel.

*St. John, N. B.* C G CLARK

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# What Is the Generator Power Factor?

## *Answers to March Question 2*

## *The Question*

OUR GENERATING PLANT *is tied in with others on a large power system. When the system power factor is low, we sometimes put a generator on the bus to supply reactive kva only, leaving the remainder of the plant to carry a kilowatt load at a moderate power factor. The machine draws a small load from the system which is shown by the integrating kwhr meter running backwards.*

*With 2000 amp per phase, practically all wattless on this machine, an hourly reading of —400 kwhr, and a bus voltage of 2100 volts, what will be the power factor of this machine from the equation* $P = E\ I\ (1.73)\ pf$*?*

*Every hour we total the station kilowatt-hours and the amperes per phase of all generators to find the station average power factor. Should the above-mentioned 2000 amp of the motoring unit be added in with the plant load to determine the average power factor of the station? Is this leading current which will improve the station average power factor? Would it be possible to have this problem illustrated with a simple vector diagram?—MGW*

## Does Not Improve Plant Power Factor

THE POWER FACTOR of MGW's machine can be found by using his equation.

The minus sign of the kwhr meter is not used because it indicates only that the unit draws power from the bus. The vector representation of the condition for this single unit is given below, Fig. 1, where the current is compared with the phase-to-neutral voltage. This is permissible with balanced currents and voltages even though the system be delta-connected and no actual neutral connection exists. The phase-to-neutral voltage is equal to the phase-to-phase voltage divided by 1.732 and is displaced 30 deg from it. $\phi$ is the angle whose cosine is 0.055. Here

$$pf = \frac{P}{3 \times E_{NA} \times I}$$

where $E_{NA}$ = phase to neutral voltage = 2100 ÷ 1.732.

Power factor of the plant as a whole likewise can be computed provided the output volts, amperes and kilowatts can be determined. Take the kilowatts as the algebraic sum of the kilowatts of each machine, with due respect to the minus sign, and the voltage as that of the bus; but the current must be measured as the total amperes by one ammeter. The amperes of the individual units cannot be added to get the total amperes as the current of the motoring unit is not in phase with that of the power-generating units.

The conditions are shown in Fig. 2, which represents one phase only. $I_M$ is proportional to the motoring unit amperes, $\phi_M$ being its phase angle with respect to the phase-to-neutral voltage, $E_{NA}$. $I_L$ is proportional to the load current at connection of plant with system, and $\phi_L$ is its phase angle with respect to the phase-to-neutral voltage. The cosine of $\phi_L$ is the plant pf. The value and angle of this load current has been assumed, as no information was given concerning it.

The resultant, $I_G$, of these two currents is proportional to the current supplied by the generators, and the cosine of the angle $\phi_G$ is the power factor of the generating units. It can be seen

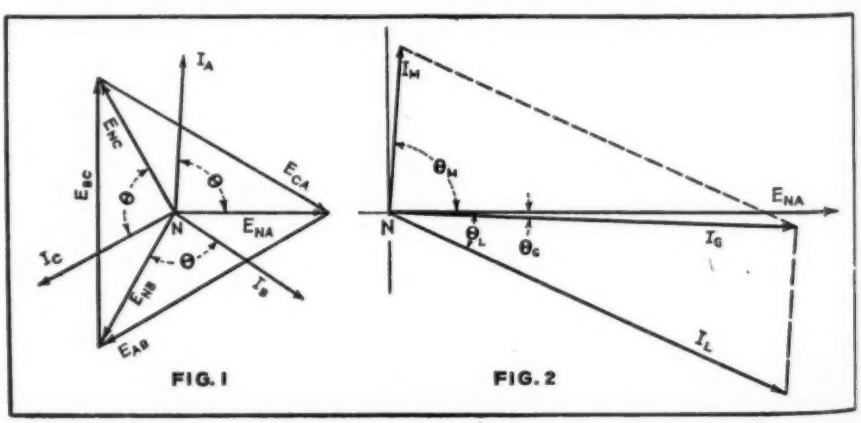



FIG. 1 FIG. 2

that the arithmetic addition of $I_M$ and $I_G$ does not result in $I_L$ or plant-output.

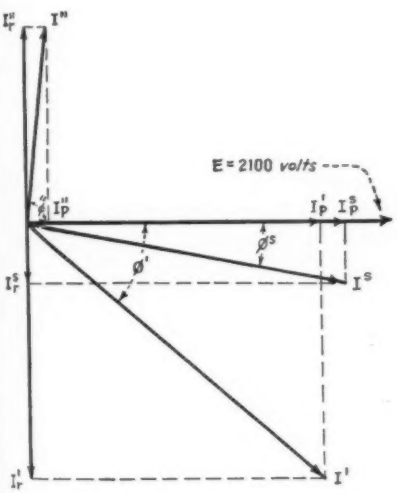
Motoring of the unit does not tend to improve the over-all plant pf but does relieve the generating units of the burden of supplying the reactive component of the current.

*Pocatello, Idaho* RUSSELL WOOD

## Add Currents Vectorially

THE 2000 AMP of MGW's motoring unit must be added vectorially to the plant load to determine the station average pf. Vectors must be used because the generator currents are out of phase with the bus voltage by an angle which is fixed by the generator pf. To simplify the vector diagram, assume that there are two generators in the plant. One generator, denoted by a single prime, carries load at lagging pf. The other, denoted by a double prime, is operating as a synchronous condenser to carry part of the station reactive. The two machines, operating in parallel, have same terminal voltage (sketch below).

The components of current in-phase




with bus voltage for each machine are:

$$I_p' = \frac{kw' \times 1000}{1.73 \times 2100} \text{ and } I_p'' = \frac{kw'' \times 1000}{1.73 \times 2100}.$$

The pf of each machine is

$$pf = \cos \phi' = \frac{I_p'}{I'} \text{ and } pf = \cos \phi'' = \frac{I_p''}{I''}.$$

where I′ and I″ are the currents per phase of the respective machines.

It is also necessary to find the components of current in quadrature with bus voltage for each machine. These are:

$$I_r' = I' \sin \phi' \text{ and } I_r'' = I'' \sin \phi''.$$

The in-phase and quadrature currents are added in the vector diagram to obtain the total in-phase $I'_p$, and quadrature $I'_r$, currents of the generator, or:

$$I_p^s = I_p' + I_p'' \text{ and } I_r^s = I_r' - I_r''.$$

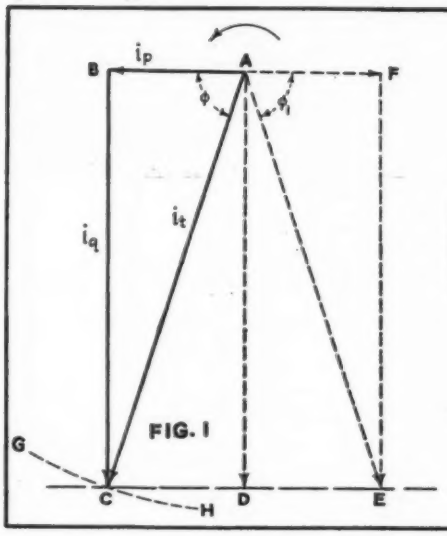



FIG. 1

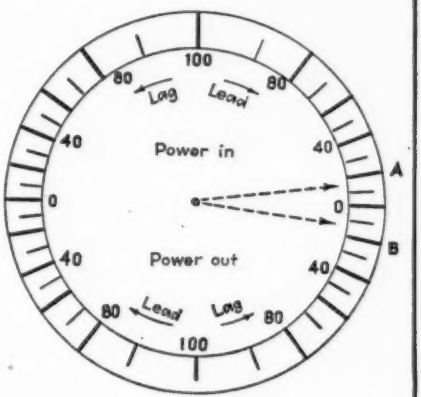



FIG. 2

Total generator output current,

$$I^s = \sqrt{(I_p^s)^2 + (I_r^s)^2}$$

and the generator average pf is

$$PF^s = \cos \phi^s = \frac{I_p^s}{I^s}.$$

Vector diagram shows the improvement in the generator pf, as evidenced by angle $\phi_s$ being smaller than angle $\phi'$. This improvement is caused entirely by the synchronous condenser carrying reactive originally supplied by the generator. However, over-all station pf is not improved because the station still supplies the same amount of kw and reactive kva to the load.

*Catonsville, Md.* R N YOUTZ

## Simple Vector Solution

THE AMPERES OF DIFFERENT machines, operating at different pf, should never be added together directly or arithmetically. The in-phase amp and the reactive amp should be determined separately for each machine. This is explained by drawing a vector diagram for each machine. The in-phase amp would be:

$$i_p = 1000 \times \frac{kw}{E \times 1.73}$$

and should be drawn to scale as the horizontal line *AB* of Fig. 1. Using the same scale, set a compass to draw an arc whose radius is proportional to the amp as read by the ammeter of the machine, and draw the arc *GH*, as shown. Through the point *B* draw a vertical line *BC* to the arc. Now draw the line *AC*. (See sketch at top of page)

The reactive amp can be scaled from the vector diagram as drawn by the length of *BC*, or calculated arithmetically by the formula:

$$i_q = \sqrt{i_t^2 - i_p^2}$$

where: $i_q$=reactive amps, $i_p$=in-phase amps, and $i_t$=total machine amps.

Vectors, as shown above, are conventionally considered to be rotating counter-clockwise around the center axis, in this case the point *A*. The vector for the total current *AC* therefore leads the vector for the in-phase current *AB* by the angle $\phi$ and the pf is leading, the value being $pf = \frac{i_p}{i_t}$.

After thus computing the in-phase amp for each machine, add these values, their total being $I_p$. Also, add the individual values for the reactive amp, the sum being $I_q$. Using the two sums thus derived, calculate the total amp for the plant by:

$$I_t = \sqrt{I_p^2 + I_q^2}. \qquad \text{The plant pf} = \frac{I_p}{I_t}.$$

When adding take care to observe the correct algebraic signs of the various values. If the $i_p$ values of all generators are considered as positive, the $i_p$ value of any machine operating as a motor will be negative. Under these conditions and assuming the fields to be correctly adjusted, all of the $i_q$ values would be of the same sign and would be directly added together.

Referring again to Fig. 1, the vector *AB* represents the in-phase current of MGW's generator while running as a motor. If the prime mover of that generator is now made to develop power, the effect would be to reduce the length of vector *AB*, while at the same time the vector *BC* remains the same length but moves to the right as the point *B* moves to the right. When the prime mover develops enough power to carry the total generator losses, the generator draws no in-phase current from the line nor does it produce any in-phase current.

The vector *AB* reduces to zero, the reactive-current vector *BC* moves to position *AD*, and the pf is zero. If the

(*Continued on page* 150)

# Q&A QUESTIONS & ANSWERS FOR POWER ENGINEERS

By ALEX HIGGINS

# 3 —*Watertube Boilers—Figuring Surface*

*Third in a series that is running in every number of* POWER. *From long experience as a professional and practical engineer, Alex Higgins asks and answers some direct questions regarding power equipment—its construction, principle, maintenance, efficiency and safe operation. In outstanding fashion he drills the young power engineer, polishes up the old-timer's knowledge, helps all comers pass engineer examinations and win certificates of higher grade. Besides being invaluable as a study course for examinations, it is a good review for the chief himself who wants to do a better job.—Editor.*

## *Watertube Boilers*

*Q 1—Describe the longitudinal and cross-drum Babcock & Wilcox (B & W) watertube boiler.*

A—A small-sized longitudinal-drum B & W boiler, Fig. 1, has one drum; larger boilers, two or three drums. Drums run from front to rear of boiler. The inclined, straight steel tubes, usually around 4-in. outside diameter, are connected with the drum by pressed-steel headers. A mud drum below the rear headers collects sediment and is blown out from time to time. Tube headers are in one piece for each vertical row of tubes. Staggered tube holes force hot gas to follow a tortuous path as it passes up around the water tubes. Header handholes for tube cleaning are closed by bolted covers with machined joints. Superheater, usually fitted in the space below the steam drum, is a set of U-tubes. Saturated steam from the drum passes downwards to be superheated in these tubes, then passes from the bottom superheater header to the main stop valve and header.

*Q 2—How is the B & W longitudinal-drum watertube boiler supported?*

A—The boiler is suspended from cross beams attached to the steam drum and supported by steel columns.

*Q 3—Have watertube boilers any advantages over firetube types?*

A—The watertube boiler is supposedly safer, largely because bulk of water is in small units—the tubes. If a tube ruptures, only a comparatively small body of water is released to flash into steam instantly. As a rule, all parts of the watertube boiler are readily accessible for cleaning, inspection and repairs. Watertubes are faster steamers because of their large heating surface, long gas travel, and rapid and positive water circulation. For the same reasons, they can carry much greater overloads and respond more readily to sudden changes and fluctuations in demand.

*Q 4—Describe the Stirling watertube boiler.*

A—This is a bent-tube type of watertube boiler. There are now many variations and adaptations, but the original "standard" Stirling boiler has three upper steam drums, connected by curved tubes to a single mud drum at the bottom. Steam drums are connected to each other by short curved tubes, as in Fig. 2. These equalize steam pressure and water level in the three drums, though water level usually varies a little in operation. Hot furnace gas is guided through the water tubes by baffle tiles behind the tube banks. Feedwater enters the rear drum, moves down the rear bank of tubes, then up the front banks. Steam is delivered from the top center drum. Upper drums are suspended from steel cross beams, bolted to steel columns. Lower mud drum hangs freely by the tubes from the upper drums, and thus can move in any direction as the boiler parts expand and contract with temperature changes. The furnace is inclosed in a brick setting faced with a refractory material and is usually air cooled or water cooled.

*Q 5—What are the advantages of the Stirling watertube boiler?*

(*Continued on page* 118)

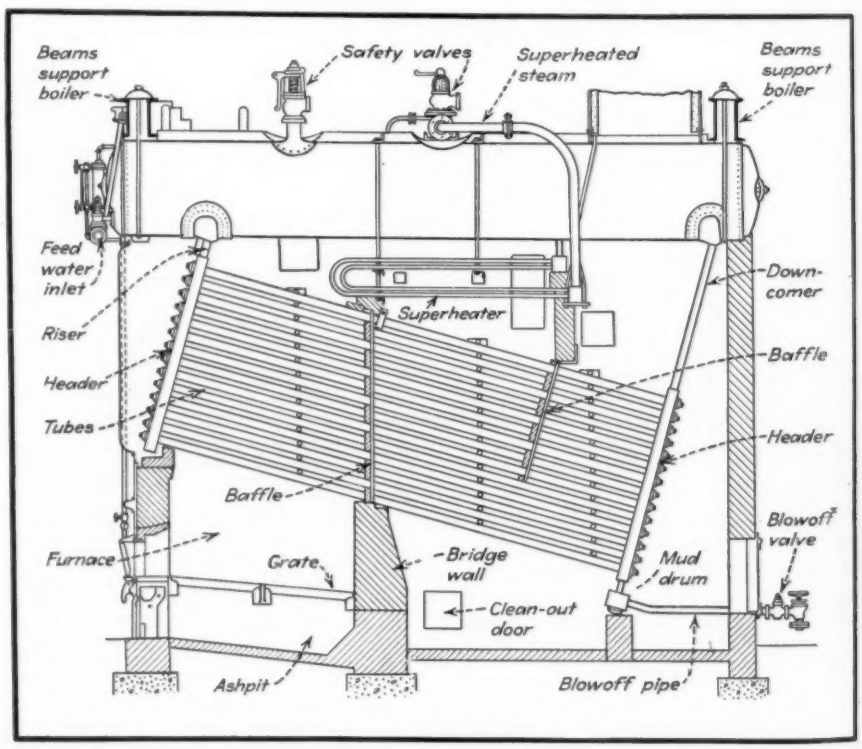



**Fig. 1—Small Babcock & Wilcox watertube boiler with longitudinal drum running from front to rear of boiler. Large boilers have two or three drums**

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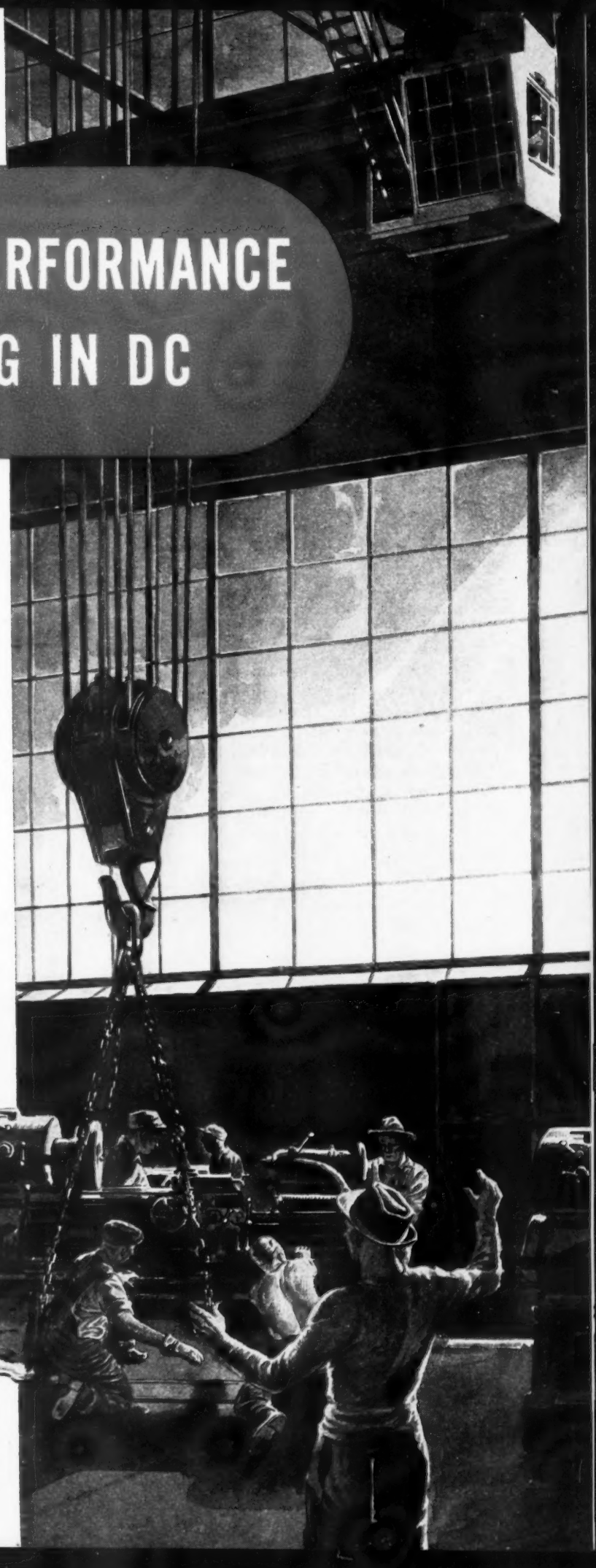

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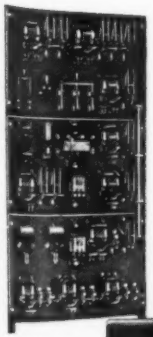

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# Q&A FOR POWER ENGINEERS

(*Continued from page* 116)

A—It has a large heating surface, an extremely long gas travel from fire to chimney and an efficient system of water circulation. Method of suspending the boiler by the upper drums and use of curved tubes allow all parts of the boiler to expand and contract freely under varying temperatures, thus reducing danger of excessive strains in any part. All parts of the boiler are readily accessible for cleaning, inspection and repair.

*Q 6—What are modern trends in steam-boiler design and construction?*

A—Main changes in the smaller ones, such as locomotive and horizontal-return-tubular, are in construction rather than design. Welding is now widely used to replace riveted shells and drums. Nozzles are welded to shells and many minor details that formerly involved riveting are now made by electric or oxyacetylene welding.

Pressures have increased little on fire-tube boilers, chiefly because thickness of firebox plates and shell plates directly exposed to intense furnace heat cannot be increased without danger of burning the plates on the fire side. With a very thick plate, heat cannot pass through rapidly enough from fire side to water side to prevent overheating. Watertube boilers are invading the small boiler field in increasing numbers. There are two main types: the 2-drum boiler, with an upper and a lower drum connected by bent tubes, and the 3-drum boiler, with two upper drums and one lower drum connected by bent tubes.

Large modern boilers are practically all of the bent-tube watertube multi-drum design. This very flexible form of construction lends itself readily to a great variety of tube and drum arrangements. Drum diameters are small; heavy drums are of all-welded construction. Steam pressures of 1000 psi and higher are common. Furnace walls are air or water cooled. Preheating air for combustion by passing it through flue-gas-heated air heaters utilizes heat that would otherwise be wasted. Water walls protect the setting from furnace heat and form part of the boiler itself, as water from the drums circulates through the wall tubes and absorbs radiant furnace heat. Crushing and firing coal in powdered form is also common practice in large boiler plants.

*Q 7—Sketch a large, modern watertube boiler with water-wall furnace, air preheater, superheater, economizer and pulverized fuel system of firing.*

A—An outline sketch of a large watertube boiler and furnace of modern design is shown in Fig. 3.

*Editorial Note: The following comments and examples on boiler heating surface have been considerably modified from Mr Higgins' notes in order to stress certain viewpoints of* POWER; *its editors accept responsibility for the rest of this article.*

### *Figuring Heating Surface*

Since most of the parts that make up boiler heating surface are circular or cylindrical shells, every engineer should know the easiest ways to figure these areas.

For practical engineering purposes, the most convenient formulas are:

Circumference of circle = 3.1416 x diameter

Area of circle = 0.7854 x square of diameter

Note that the second formula is just another way of stating that if you draw a square around a circle, area of the circle is 78.54% of area of the square. Rules illustrated in Fig. 4 and 5.

It is not always necessary to use all known "places" or digits of a factor, piece of data or result of a computation. How many to use depends on the accuracy required. For most boiler computations it is close enough to use the factors 3.14 and 0.785, respectively. Using 3.14 instead of 3.1416 involves an error of only 1/20 of 1%, or 1 sq ft

(*Continued on page* 120)

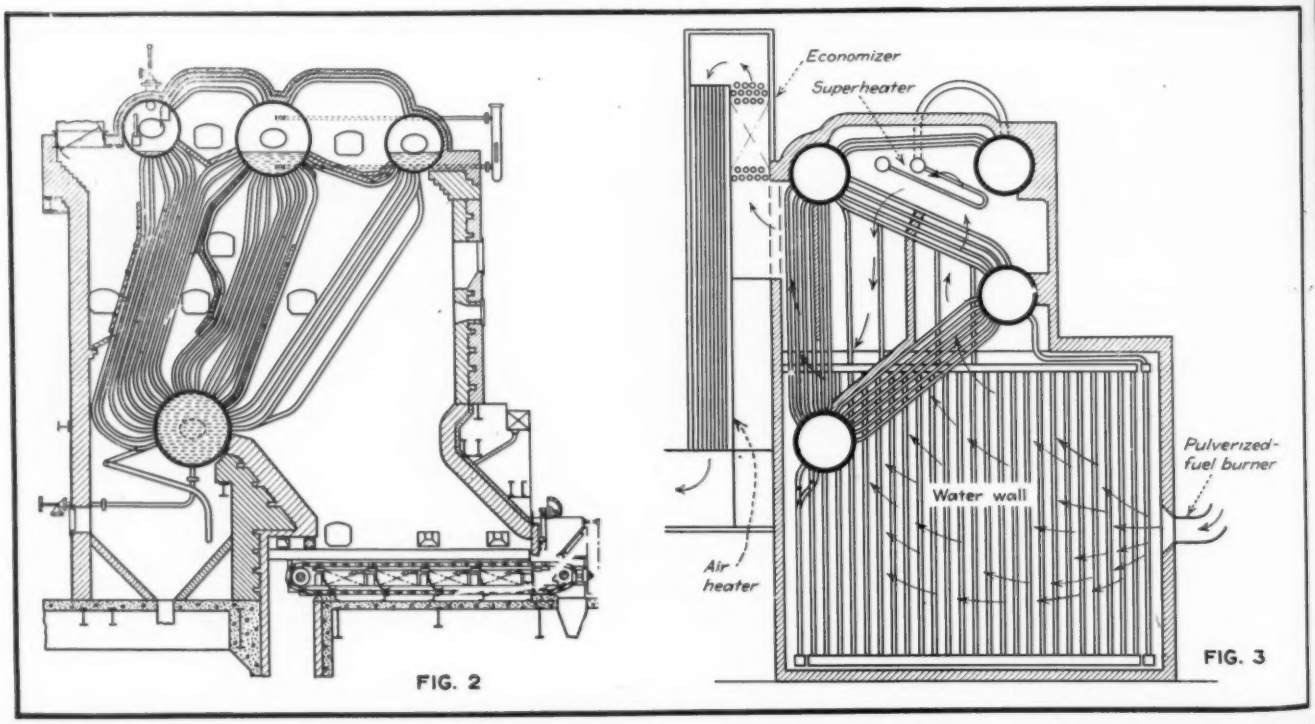


**Fig. 2—Stirling watertube boiler with chain-grate stoker. The standard form has three upper steam drums connected by curved tubes to a single mud drum, as sketched. Fig. 3—Outline sketch of typical modern watertube boiler**

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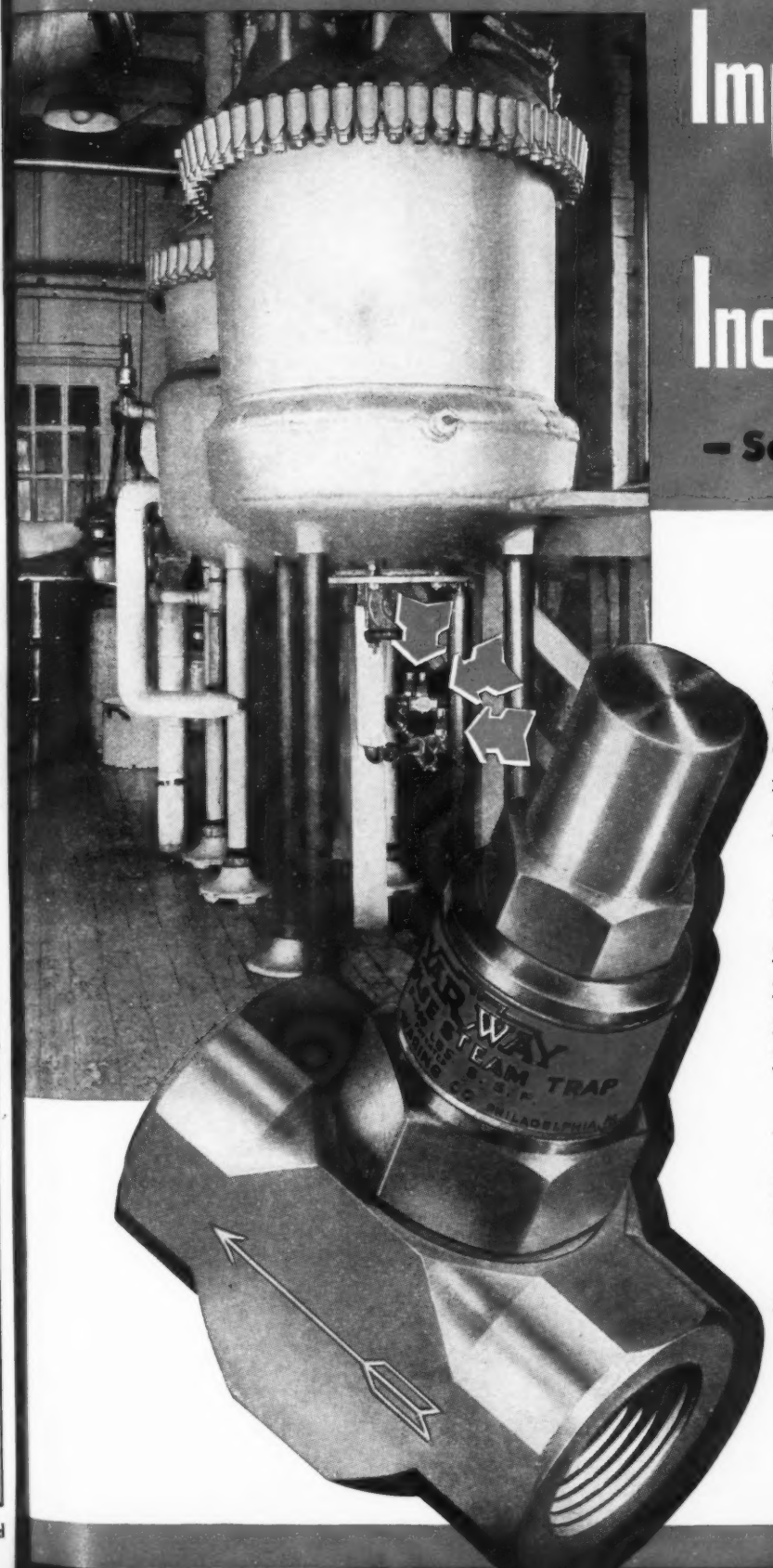
## – Says G. W. Carnrick Co.




SINCE the first Yarway Impulse Traps were installed, the improved heating and increased efficiency obtained have induced the G. W. Carnrick Co., (makers of liver extracts and other compounds), to purchase no other make. Today, about *80 per cent of the traps in their plant are Yarways.*

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YARWAY IMPULSE STEAM TRAP

# Q&A FOR POWER ENGINEERS

(Continued from page 118)

out of 2000 in boiler heating surface. Any attempt to figure closer than this is generally a waste of time: first, 1 sq ft in 2000 is not important; second, errors in measurement throw the result off more than 1/20 of 1% in any case. The same applies to use of 0.785 instead of 0.7854.

### *Figuring Surface Area*

Area of a flat, rectangular surface is merely the product of its two dimensions. To figure the surface area of a cylinder, such as a tube or drum, imagine the surface unrolled to a flat, rectangular shape. Length doesn't change; width is the circumference of the original circle; area is the product, as shown in Fig. 5.

Here are some important points to remember in figuring heating surface:

1. If dimensions are in feet, area comes out in square feet.

2. If dimensions are in inches, area comes out in square inches. Divide square inches by 144 to get square feet.

3. When many tubes are the same length, figure the surface of one tube in square feet. Then multiply this area by the number of such tubes.

4. Boiler heating surface is always measured on the side exposed to the fire. Thus, the heating surface of *water tubes* is based on *outside tube diameter;* that of *fire tubes* on *inside diameter.*

5. When tubes enter a sheet or drum, deduct area of the tube holes from the gross area of sheet or drum to get net heating surface.

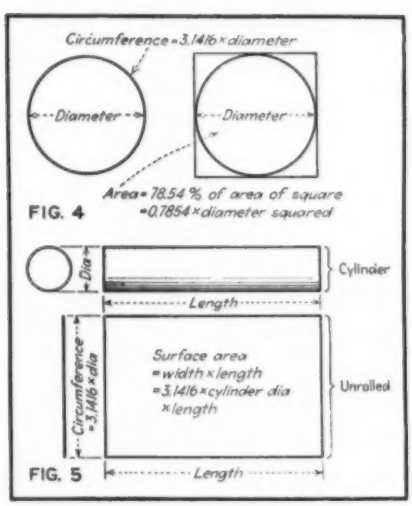


**Fig. 4—Rules for circumference and area of a circle (above). Fig. 5—Surface of the cylinder is the circumference times the length (below)**

*Q 8—How many sq ft of heating surface are there in a boiler furnace flue 3 ft in diameter and 12 ft long?*

A—Circumference of flue = 3.14 × 3 = 9.42 ft. Heating surface = area of flue = circumference × length = 9.42 × 12 = 113.04, say 113 sq ft.

*Q 9—How many sq ft of heating surface are there in an 18-ft long boiler fire tube of 3¼-in. internal diameter?*

A—Heating surface of a fire tube must be based on *internal* circumference, which here is 3.25 × 3.14 = 10.205 in. This is 10.205 ÷ 12 = 0.8504 ft. Then, flue surface = 0.8504 × 18 = 15.307 sq ft, say, 15.31 sq ft.

### *Comments on "Decimal Places"*

All through the last computation there is the question of how many "places" to carry the various intermediate answers. Many schools still teach that arithmetical problems should be carried a certain number of *decimal places,* but this is not sound practice and often gives foolish results—sometimes needlessly precise, sometimes too rough.

Examples make this point clear. The correct thickness of a certain piece of paper is, say, 0.0055 in. Any one taught to carry all numbers to three places of *decimals* would write down 0.005 in., which is in error by 10%. Asked to express a 1000 in. length in ft, the same man would write 1000 ÷ 12 = 83.333 ft, which is correct to better than 1/200 of 1%. It may well happen that this degree of precision has no practical meaning. The 83.333 is more than 2000 times as precise as the 0.005, yet both have three decimal places. All of which proves that a given number of decimal places doesn't mean a given degree of precision.

What is important is not the number of *decimal places,* but the number of *significant figures,* so called. To determine the number of significant figures, start counting with the first digit *that is not a zero* and count all digits from there on, including zeros.

Thus, 4163., 0.4163 and 0.0004163 are all written to four significant figures and all represent the same order of precision in percentages.

Similarly, 3 and 0.00000003 are both written to one significant figure only, and both represent a very *low* order of percentage precision, even though the second number is written to eight decimal places.

*Such examples show that the engineer reader who has been in the habit of counting decimal places should shift over to significant figures if he wants to keep out of trouble in his computations.*

In the problems worked out in Questions 8 and 9 we used the value 3.14, a constant carried to three significant figures. That choice sets the limit of possible precision for the whole computation at about 1/20 of 1%. It is a good rule of thumb that the various steps in a computation may carry one or two more significant figures than the data or factors used. Anything beyond that is meaningless. Note that this rule was followed in working out the problems. Most of the steps were carried to four significant figures. The cases where the answer was carried to five figures were justified by the fact that the first digit was a low number. That often warrants using two more significant figures instead of one more. Thus 0.8504 was carried to four figures, but 10.205 to five figures.

### *Hrt Problem*

We follow this general rule in working out the following problems:

*Q 10—A horizontal - return - tubular boiler is 5 ft in diameter and 16 ft long. It contains 60 tubes of 3-in. outside diameter and 2.732-in. inside diameter. Find the boiler heating surface. Take inner surface of tubes, half of the shell surface and two-thirds of the tube plate area, less the area of the tube holes.*

A—Circumference of shell = 5 × 3.14 = 15.700 ft

Half circumference of shell = 15.700 × ½ = 7.850 ft

Area of half circumference of shell = 7.850 × 16 = 125.60 sq ft

Inner circumference of fire tube = 2.732 × 3.14 = 8.578 in., or 8.578 ÷ 12 = 0.7148 ft

Surface of one tube = 0.7148 × 16 = 11.437 sq ft

Surface of 60 tubes = 60 × 11.437 = 686.2 sq ft

Total area of one tube sheet = 0.7854 × 5 × 5 = 19.635 sq ft

Two-thirds area one tube sheet = ⅔ × 19.635 = 13.090 sq ft

Area of one tube hole = 0.785 × 3 × 3 = 7.065 sq in.

Area of 60 tube holes = 60 × 7.065 = 423.9 sq in., or 423.9 ÷ 144 = 2.94 sq ft

Net heating surface of one tube sheet = 13.09 − 2.94 = 10.15 sq ft

Net surface of two tube sheets = 10.15 × 2 = 20.30 sq ft

Total net area = 125.60 + 686.2 + 20.30 = 832.10 sq ft, says, 832 sq ft.

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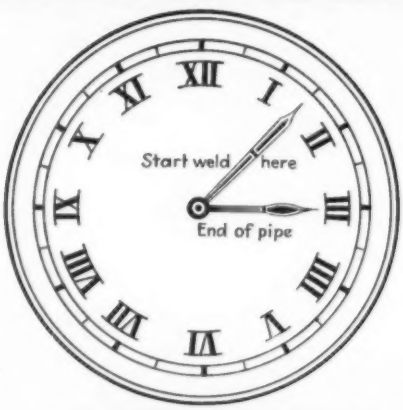
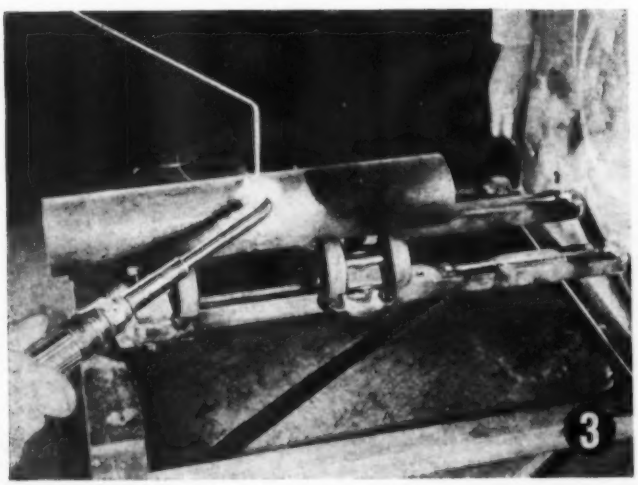
# HOW TO LEARN TO MAKE ROLLING WELDS

*This is the second of a series teaching the basic elements of pipe welding, for beginners and for experienced welders who want to break in new men. Refer back to April* POWER, *(page 126) for list of materials and preliminary instructions. Pictures and data by courtesy of Linde Air Products Co.*




**1** Start by learning to make a rolling weld in 2-in. pipe. Because wall thickness is less than 3/16 in. it is not necessary to bevel the ends of the pipes. First tack weld the two pieces to hold them in proper position. Putting the pieces in the valley of a 2-in. angle iron insures accurate alignment. Space ends ⅛ in. apart and make tack welds at three points equally spaced around the pipe. Use a Purox No. 3 head, or the corresponding size if another make of blowpipe is used. Heat a small spot of the two edges and just as they melt and flow together introduce the ⅛-in. welding rod into the puddle and melt off enough to make a tack weld. Hold blowpipe and rod so as to make about 90-deg angle with each other, each making about 45 deg with the pipe surface. Make tack welds about ¼ in. long and only deep enough to hold pipes together

**2** After tack welding, remove angle iron, place pipe on rollers of turning rig (see April POWER) and proceed to make the weld proper. Begin about halfway between any two tack welds. Roll pipe so starting point is at 1:30 o'clock

**3** With circular motion and flame adjusted to neutral, heat general area of weld until visible red color shows, gradually narrowing circles to a small spot. Melt edges for a distance of about ⅝ in. Just as metal starts to flow, introduce welding rod and fill up intervening space. Hold rod more or less vertical and in same plane as pipe cross-section. Hold blowpipe so tip and flame are approximately horizontal and so that rod and tip are about 90 deg apart. Flame should point slightly upward so that molten puddle will be almost horizontal, which is a great aid in keeping it under control. Be sure to get deep, thorough fusion of the base metal and added rod metal but do not try to penetrate all the way through. This is common practice in welding unbeveled pipe to avoid "icicles"

**4** After first ⅝-in. section is complete, roll pipe clockwise ⅝-in. Then start as before and weld next section. Reinforce welds by building them up about 1/16 in. higher than pipe surface. When a tack weld is reached, remelt it into the weld as the work progresses; otherwise, metal under the shallow tack weld will not be thoroughly fused and a weak spot will result. Finished weld should have smooth, even appearance shown in photo.

Next, prepare to make a rolling weld in 6-in. pipe. Bevel pipe ends as described in April POWER, clean off oxide

(*Continued on page* 124)

# The Balance of Power!

Ability to produce for ourselves and our allies is completely dependent on the generation of power—the energy that turns the wheels of industry. The common enemy of power is water-deposited scale. It must be removed, if boilers are to deliver their full quota of B.T.U.'s. The conventional practice for scale removal is a manual operation consuming much time. Chemistry has stepped in and now provides an efficient method that removes the scale in a few hours.

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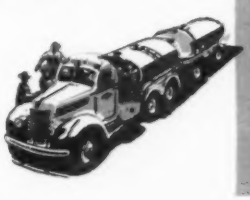

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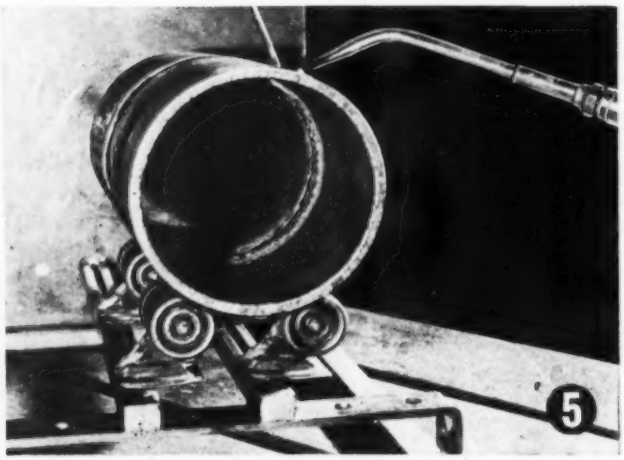
FOR INDUSTRIAL CLEANING AND SCALE REMOVAL SERVICE

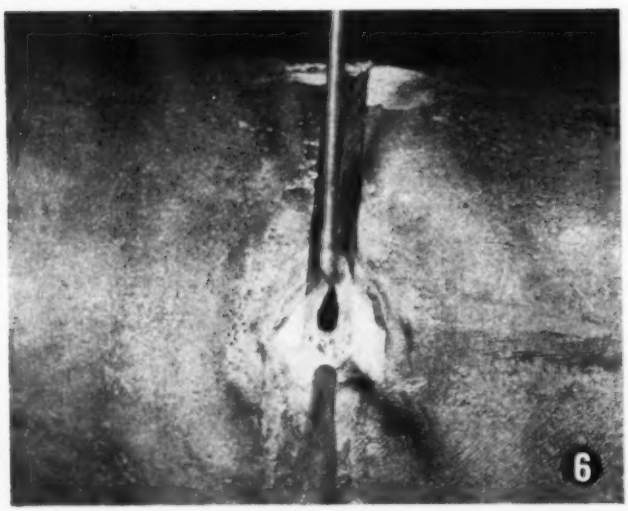
*Continued from page 122*

with file, or hammer and chisel, line up in angle iron and make three shallow tacks in bottom of vee. Space between edges before tacking should be about ⅛ in. The longer it takes to make the weld the more the spacing will close up by contraction. If spacing is too wide, there will be difficulty in bridging it with molten metal. On the other hand, if spacing is too narrow, edges will draw together and actually overlap. At no time during welding operation should edges be less than 1/16 in. apart.




**5** When finished tack welding, remove angle iron and mount pipe on rollers for welding. Use 3/16-in. rod and, if Purox No. 31 blowpipe is used, fit a No. 7 head—or its equivalent if another make blowpipe is used. Weld in 1:30 o'clock position, starting halfway between tacks. Again, hold pipe and rod about 90 deg apart and each 45 deg with pipe

Melt edges at bottom of vee and fill in gap between them with rod, making sure that rod and base metal fuse thoroughly. After gap has been bridged for ½ in., go back and completely fill vee, reinforcing weld by building it up slightly higher than pipe. Each time weld advances to about 1 in. from top, as in photo, roll pipe to bring end of weld down to 1:30 o'clock position so that puddle will be approximately horizontal

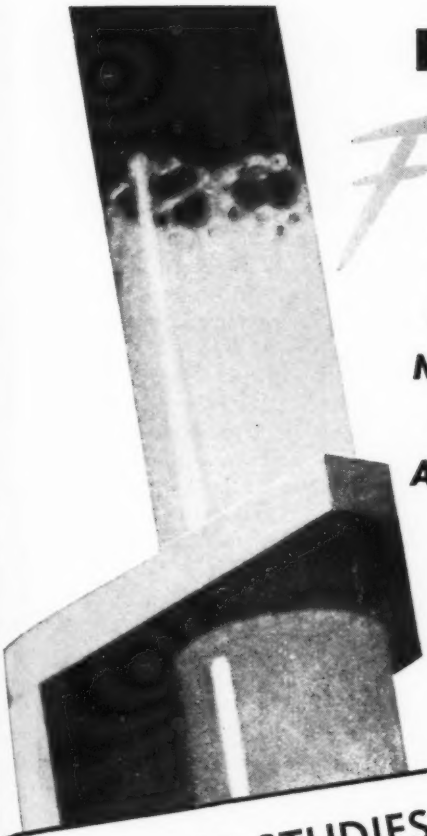



**6** If too much heat is applied when bridging bottom of vee, a hole may burn through. If this occurs, do not proceed farther until hole has been closed. Roll pipe to bring hole to 3 o'clock position. Edges will then be perpendicular and there will be less tendency for molten metal to fall through to pipe interior. Gravity helps build up bottom edge of hole. Hold rod almost perpendicular and point flame upward. Just barely melt edges of hole and bridge them together with rod metal until hole closes completely. Pipe can then be rolled back to 1:30 o'clock position and welding continued in normal fashion.

**7, 8** Completed weld should show smooth, even ripples on outside and be free from projections or "icicles" on inside

# FUMING ABOUT FOAMING?

**NALCO NO. 7-AF IS THE ANSWER!**



## CASE STUDIES of NALCO 7-AF in Action

"Nalco #7-AF has elminated wet steam in the _____ Canning Company which had previously caused deposits on the cans during cooking process, thus allowing them to operate their boilers and can cookers uninterruptedly and at high ratings throughout the season."

★ ★

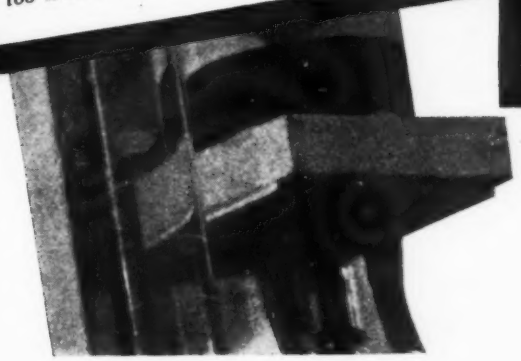
"Since using #7-AF here, there has been no carryover of any kind. The dosage is ½ grain per gallon. They are carrying the heaviest load in their history right now."— **A Meat Packing Plant.**

★ ★

"We have rolling equipment over here which the operators refuse to move unless there is a supply of #7-AF in the cab."— **A Steel Mill.**

★ ★

"We have had absolutely no sign of carryover and absolutely no superheater trouble since we began using the #7-AF. Previous to the use of #7-AF we have always had trouble getting the operators to use aftertreatment, and now we are having much trouble in keeping them from using too much."— **A Steel Plant.**



YOU need *smooth boiling* if you are to get maximum output from your boilers and minimum maintenance of equipment. Foaming causes lubrication troubles and deposits on turbine blades, wastes fuel and power, reduces heat transfer efficiency and *disturbs normal circulation* in the boiler.

Nalco No. 7-AF, foam buster, has achieved outstanding success in minimizing foaming in both industrial and railway locomotive boilers. It does not saponify, it lasts a long time, it is used in very small quantities—only a few parts of Nalco 7-AF per million parts of water—Nalco 7-AF actually gives you all the advantages you were supposed to get with so-called antifoam agents and none of the disadvantages.

Ask the Nalco Man to tell you more about No. 7-AF—you'll call it Lucky Seven—send a postcard for details today.

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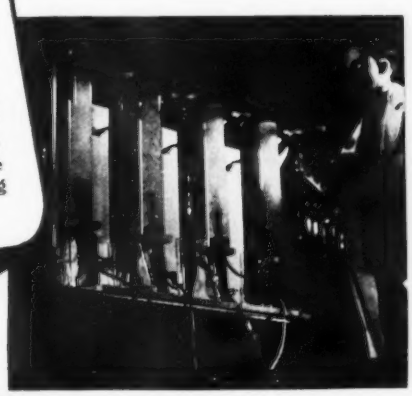


*Here's where and how Nalco 7-AF was perfected—in one of the world's finest water treatment laboratories where methods and chemicals are proven and known to work before they are recommended to you.*

*nalco*

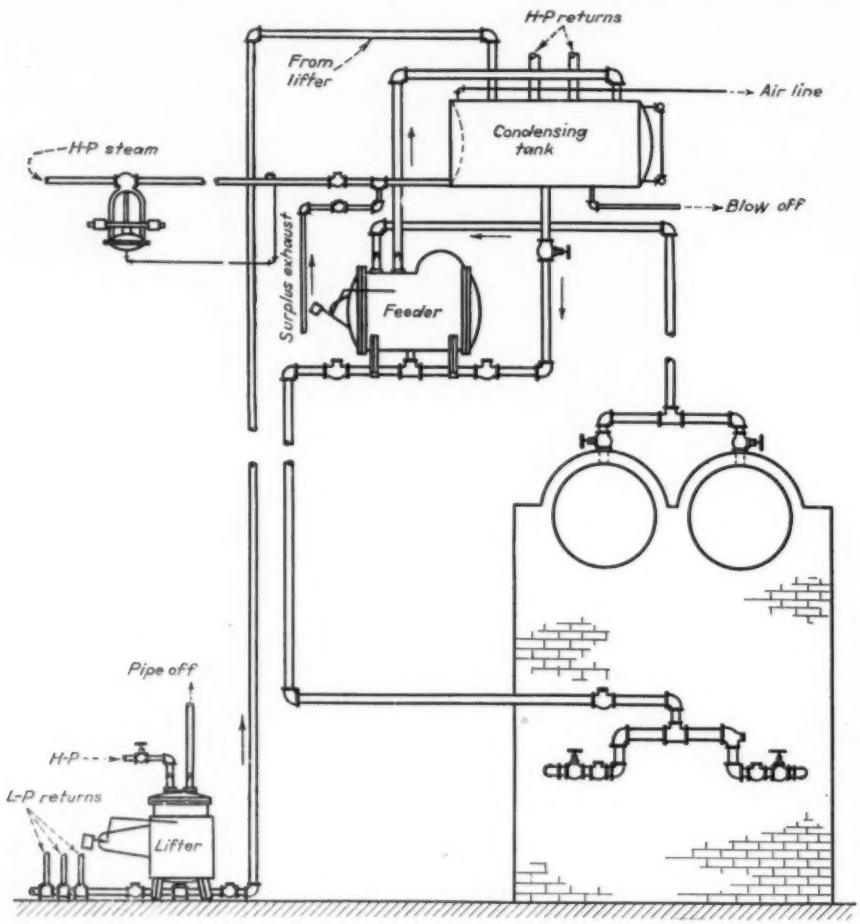
*. . . The Complete Water Treating Service*

# ARGUMENT CORNER

## Can Oxygen Be Removed?

ALTHOUGH ANSWERS to WWF's question on oxygen removal (March POWER) offered different solutions, one of the most effective and economical methods was not mentioned. This involves using a closed boiler feeding and deaerating system, in which a boiler feeder or return trap is used in conjunction with a special condensing tank.

Whenever the condensate temperature in the tank falls to 220 F a reducing valve opens and allows steam to enter a perforated nozzle underneath a water seal in the tank. Steam at 10 psi delivery pressure can be used with safety, as the return trap will handle condensate at any temperature.




Steam used by the boiler feeder or return trap contains no oil and is passed back into the deaerating tank. The amount of steam used by these modern machines is 90% less than that used by steam pumps. Air escapes through an automatic high-pressure air valve.

Wherever these devices have been installed, a Winkler test shows oxygen content has been reduced to as low as .025 cc per liter, which is somewhat better than obtained with most deaerating heaters, which usually reduce the free oxygen content to .03 cc per liter.

Should WWF have 100% condensate return during the night, not a drop of makeup would be needed. As all steam used in either the boiler feeder or through the reducing valve turns into feed water, the only loss resulting is from radiation, and this can be prevented to a considerable degree by the use of suitable insulating covering.

*Boston, Mass.* HERBERT W BRANDT

## Use of Solvents in Fuel Oil

EVERY ONCE IN A WHILE the question of sludge removal by chemicals is brought up in the various power-engineering magazines and pamphlets but, sad to relate, there have been few intelligent answers to this question.

In POWER's *New Question and Answer Book*, on page 93, the title of a question is "Dissolving Sludge." The question reads, "We have been urged to use various chemicals to dissolve sludge in our boiler fuel. No. 6 Bunker C. We have tried several, but have no

(*Continued on page* 164)

**Changing your address soon? • • •**

You will help us give you the good service that is your due by notifying us at once of your change of address. Often the monthly issues of POWER go out of print almost immediately after publication, preventing us from supplying issues that may have been misdirected. Prompt notification of address changes that have been made or will be made prevent your missing a single one of the big valuable monthly issues of POWER.

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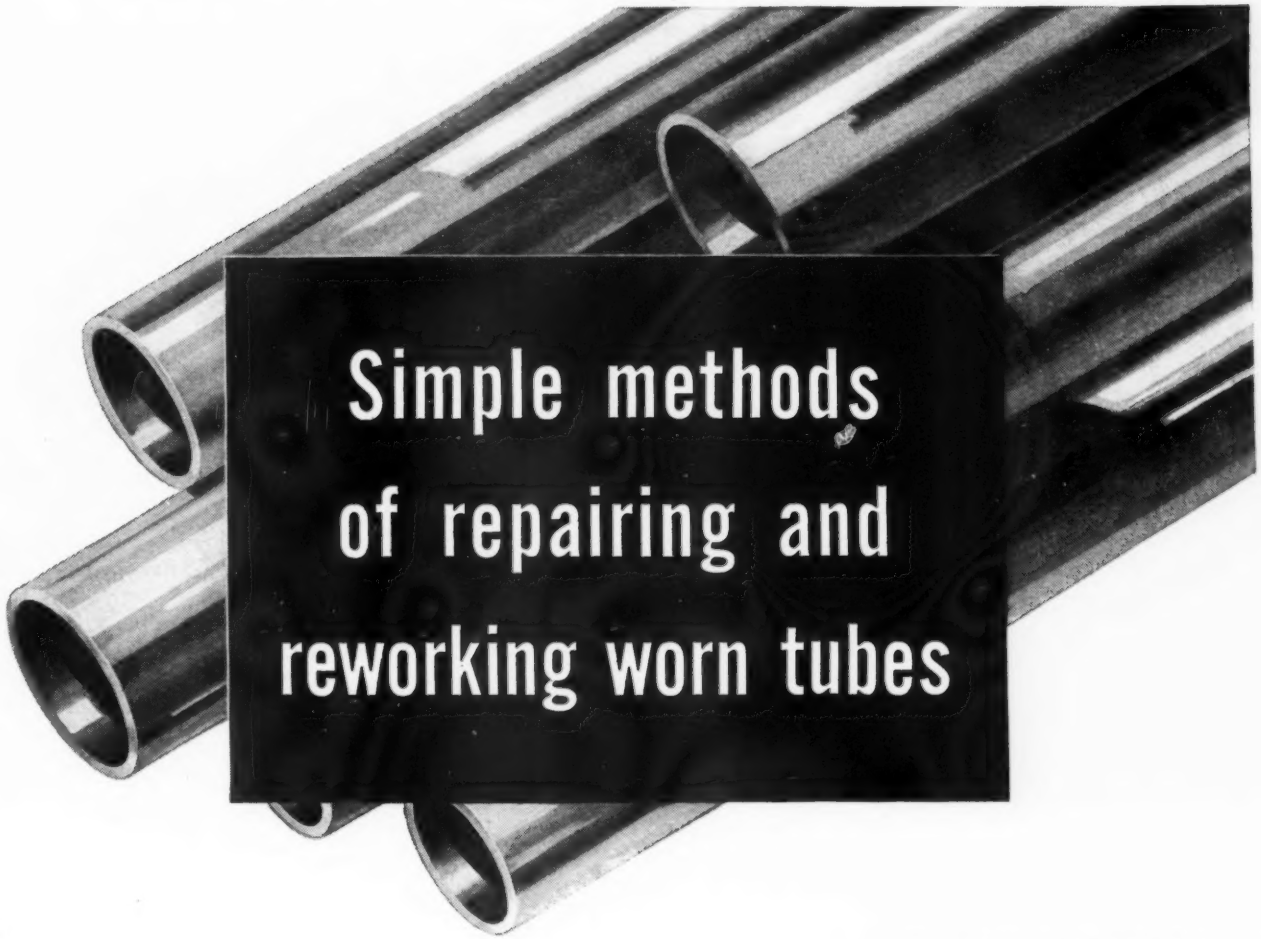
**(Send to Circ Dept, POWER, 330 W 42nd St, New York, N. Y.)**

## No. 4: Tips on Condenser Tube Maintenance



# Simple methods of repairing and reworking worn tubes

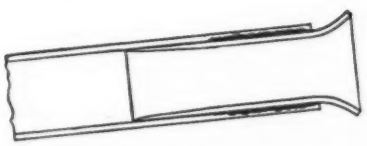
Most of the causes of condenser tube damage can be eliminated . . . and even where damage has occurred, many tubes can be repaired and put back into useful service, thereby conserving copper and other critical war materials.

The chief causes of trouble are: 1. Excessive local turbulence; 2. Finely divided air bubbles; 3. Excessive solids in the cooling water. Methods of preventing these have been discussed in previous messages in this series and further information will be supplied on request.

The following suggest several practical methods of overcoming certain types of damage to tubes, which can be easily applied under today's conditions.

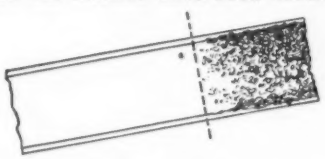
### The use of sleeves for pitted inlet ends

When tubes begin to show signs of pitting on inlet ends, the usual practice is to set flared sleeves in the



tubes. These sleeves should be carefully made to fit tightly and leave no shoulder at the inside end which might cause turbulence.

### Where the ferrules have been destroyed



In some cases, the tubes may have failed only at the inlet end, with very little corrosion elsewhere. However the ferrules may have been destroyed. In this situation, the bad ends may be cut off, the tubes then stretched and used again.

### Changing the location of tubes

When tubes begin to leak because of pitting or plug-type dezincification, and replacement seems indicated, many tubes may still be in good enough condition for further use. All the tubes can be withdrawn and carefully tested. The poorest can be discarded and those passing the test can be re-used. Longer service will follow if these re-used tubes are placed in that part of the condenser where the least corrosion has occurred.

We will be glad to send you further information on methods of prolonging condenser tube life if you will mail your request on a letterhead to the address below. 4394

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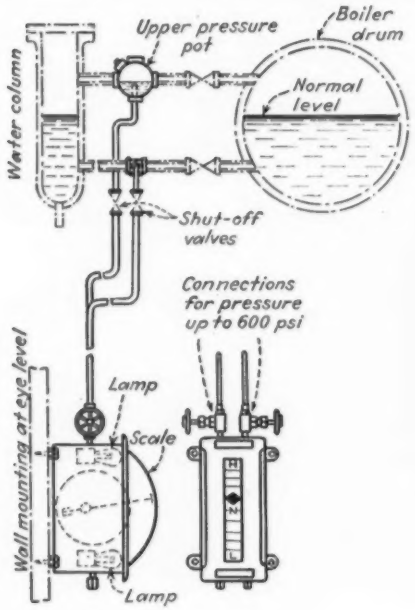
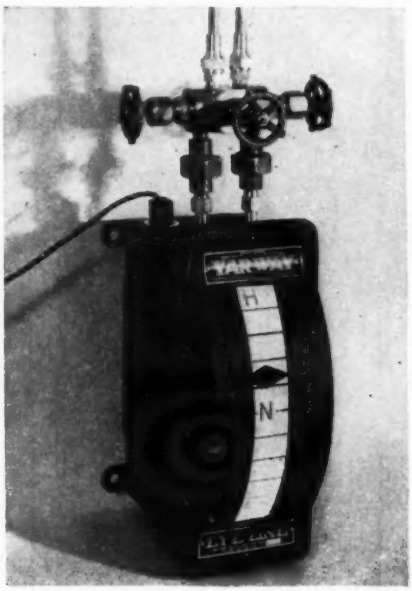
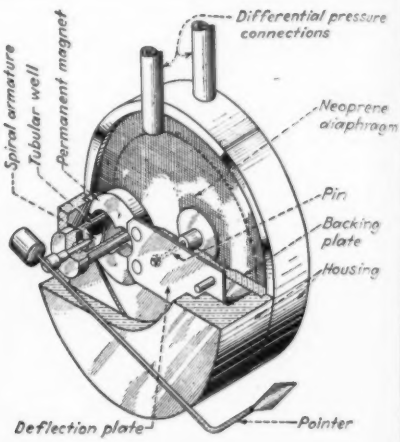
ANACONDA from mine to consumer

*Anaconda Condenser Tubes*

# WHAT'S NEW IN PLANT EQUIPMENT




## Water-Level Indicator

NEW "EYE-LINE" INSTRUMENT, wall-or-panel-mounted at eye level, shows level of water in boiler drum. Instrument is operated by difference in pressure in connecting tubes (see hookup), which is merely difference in head between fixed water level in upper pressure pot and varying water level in boiler drum.

Pressure differential acts on Neoprene diaphragm (see cutaway of instrument). Pin transmits net diaphragm force to spring-metal deflection plate, moving powerful permanent magnet along bronze alloy tubular well containing spiral armature of magnetic material. Thus rotation of armature, and corresponding greatly magnified motion of pointer, is in direct proportion to movement of diaphragm, actuated by changes in static head.

Magnetic principle permits complete separation of pressure parts from non-pressure parts without stuffing boxes. Thus magnet and deflection plate are in pressure chamber, whereas the jeweled-bearing armature in the tubular well operates freely without packing and at atmospheric pressure.

Magnet and spiral armature are equivalent to a worm wheel driving a steep-pitch worm except that normal tooth friction between wheel and worm is eliminated.

Balanced black pointer, attached to armature and revolving with it, registers changes in boiler water level on illuminated scale that shows green for normal operating range and red at high and low levels. Adjusting screw changes scale range by shifting fulcrum of deflecting plate. Another adjusts instrument zero.

A single model serves for all boiler pressures up to 1500 psi. Above 600 psi center valve shown in photograph is added to equalize pressure on two sides of diaphragm before individual valves are opened. Without this valve the backing plates fully protect diaphragm if high pressure is admitted to one side only. *Yarnall-Waring Company, Philadelphia, Pa.*

## Building Board

"STONEWALL," ALL-PURPOSE BUILDING board made of specially fabricated asbestos-cement, is adaptable to many uses to which scarce materials are commonly put. Is said to be fireproof, rotproof, verminproof and rustproof, has unusual strength, and needs no paint. Used for movable and fixed partitions for buildings; interior partitions for ships; lining for transformer and electrical equipment rooms; protection and finish for industrial powerhouse boilers; air-conditioning and ventilating ducts, and forms for concrete construction work. *Ruberoid Co, 500 Fifth Ave, New York, N. Y.*

## Speed Control Equipment

REEVES REDUCER-TYPE TRANSMISSION with built-in speed reducer meets many requirements for accurate speed control and speed reduction combined in one inclosed unit. Far less mounting space is needed to obtain lower range of speeds which formerly required use of auxiliary speed reducing equipment. Available in two designs—horizontal and vertical—which may be mounted in any convenient position. Each may be had in wide range of speeds and capacities from 1 to 7½ hp, inclusive. Transmission in either design may be equipped for individual motor drive by use of a motor base. Connection between motor and constant speed shaft of drive may be either silent or roller chain and sprocket, also V-belt or gears. *Reeves Pulley Co, Columbus, Ind.*

## Plastic Housings

"DRILLITE" PLASTIC HOUSING, made with shredded cotton duck base, has high impact resistance and withstands considerable abuse and wear, according to manufacturer. Plastic is also heat resistant and a perfect insulator against dielectric shock. Material is used for practical housings for the ¼-in. standard drill and new ⅜-in. standard drill. Steel inserts have been cast to carry all ball bearings, and threaded steel inserts in the field housing for housing assem-

(*Continued on page* 186)

IT'S OUR DUTY TO GET BETTER AND LONGER SERVICE FROM VALVES!
How to Repair Valves
TO GET RENEWED LIFE FROM GATE AND GLOBE VALVES
TO CONSERVE CRITICAL METALS
Short-Cuts to Faster Piping Jobs
FOR SPECIFIERS
TIPS ON VALVE TRIM
TO HELP KEEP PIPING ON THE JOB
11 SIMPLE WAYS TO GET BETTER SERVICE FROM PIPING EQUIPMENT
HOW TO KEEP YOUR PLANT GOING WITHOUT INTERRUPTION!
HELPFUL HINTS ON CHOOSING VALVES FOR BETTER PIPING SERVICE

# *He'll Learn Faster* From These Practical *"PIPING POINTERS"*

Millions of "green" war workers are willing and ready to learn. But it's up to you and us to give them practical aids for doing a better job.

In hundreds of plants today, training of maintenance crews is being speeded by Crane "Piping Pointers." These bulletins, based on Crane's 88-year experience in the flow control field, are aimed at a single purpose: to keep pipe lines—*your plant's lifelines*—operating at peak efficiency.

"Piping Pointers" give practical aid to veterans as well as beginners. They're full of *do's and don'ts* and *rights and wrongs* of sound piping practice. They show proper valve selection—installation short-cuts—correct repair procedures—substitutions to solve material shortages—and safety hints. Anyone can understand and use them.

### SENT FREE TO ANY PLANT

For Victory's sake, faster training of workers for better maintenance of piping is a vital *must.* In "Piping Pointers," Crane Co. shares its basic information for that use, with all industry, and offers these bulletins free to any plant. Ask your Crane Representative or write direct for your supply. Crane Co., 836 South Michigan Avenue, Chicago, Ill.

ARMY E NAVY

# CRANE VALVES

# Right Side Up . . .

The other night I saw a beetle flat on his back, kicking all his legs to get right side up again. He didn't have sense enough to concentrate his kicking on one side or the other to get himself straightened out.

Some of us are in the beetle's position. We haven't been able to get the things we need to get our plants in tip-top shape, so we've slipped along between a hope and a prayer.

Remember—we'll soon be coming to the end of the "spit, baling wire and string" period. Our war production is meeting current needs and piling up backlogs. Rubber production seems pretty sure. Plastics and plywood are saving steel on many parts. Glass and paper are helping the container problem. Aluminum and magnesium are being delivered to war plants in real quantity.

All these signs indicate release, fairly soon, of repair and replacement units. The supply will not, of course, be anything like what is needed, but there will, at least, be some available. We'll have better grades of rubber released for packings, hose, belts and other critical mechanical-rubber items. Some steel has already been released for refrigerators; more will soon be coming along for motors, pumps, and stoker parts.

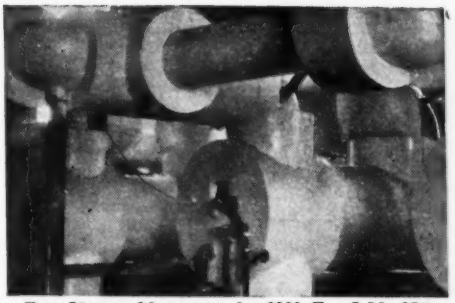
This is just a suggestion, then, to stop kicking in all directions and to begin concentrating on one side or the other to get yourself right side up. Check over your plant carefully. Make a list of critically needed items, with the most critical heading the list. Where possible, place orders for delivery "when available."

You've got to fix weakest links first—or the whole plant may bust down like the one-hoss shay before this war is finally won. It is your responsibility to see that it doesn't. Other engineers face the same problems, so available parts are sure to be rationed. Planning now will make your chances of getting what your plant needs just that much better.

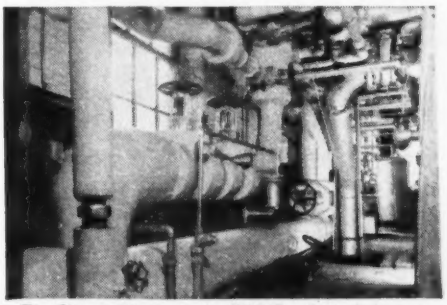
George Edwards
**Engineer**

# For lasting efficiency and maximum fuel savings

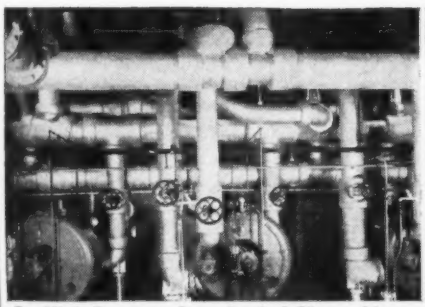
# Johns-Manville Insulations



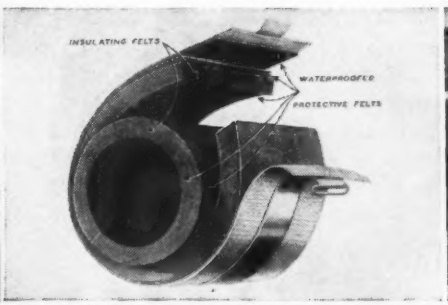
**For Steam Lines up to 600° F.**—J-M 85% Magnesia Pipe Insulation. Furnished in 3-ft. sections or segments in the following thicknesses: Standard, 1½", 2", 2½", Double Standard and 3" (double layer).



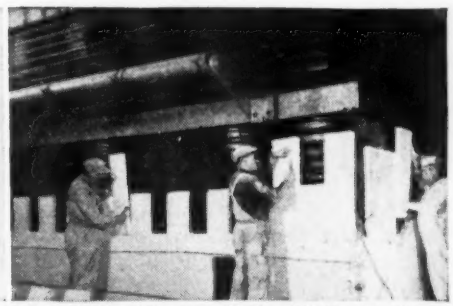
**For Steam Lines up to 700° F.**—J-M Asbesto-Sponge Felted Pipe Insulation provides high salvage and resistance to abuse. Furnished in 3-ft. sections in thicknesses from 1" to 3", for standard pipe sizes.



**For High-Pressure Superheated Steam Lines**—Superex Combination Pipe Insulation. Inner layer of Superex High Temperature Insulation with outer layer of J-M 85% Magnesia. Has unusual heat resistance; high efficiency.

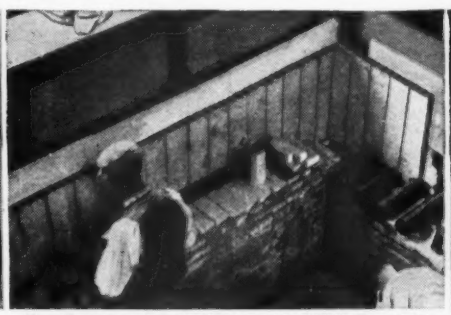



**For Cold Water Lines**—J-M Anti-Sweat Pipe Insulation. Designed to prevent condensation. In 3-ft. sections; thicknesses, ½" and ¾", solid construction; 1", 1½" and 2", broken joint construction.

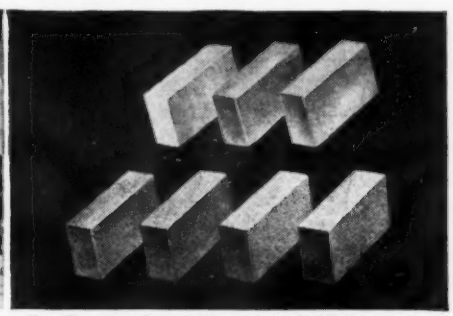


**For Boiler Drums, Water Walls, Tanks, Breechings**—J-M 85% Magnesia Blocks, highly efficient at temperatures up to 600° F. Sizes 3" x 18", 6" x 36", 12" x 36", flat or curved. Thicknesses 1" to 4".

**For Refrigerated Service**—J-M Rock Cork. Basically mineral. Can't rot, won't support vermin or mold. In sheets, 18" x 36", 1" to 4" thicknesses. Pipe covering in 3-ft. sections with integral waterproof jacket.



**For Furnace Insulation up to 1900° F.**—J-M Superex Blocks, for years the most widely used block insulation at these temperatures. Sizes, 3" x 18", 6" x 36", 12" x 36". Thicknesses, 1" to 4", flat or curved.



**For Furnace Insulation up to 2600° F.** 3 types of J-M Insulating Brick, 4 types of J-M Insulating Fire Brick, are available. Furnished in all standard 9" shapes of the 2½" and 3" series, as well as in specials.

**For details on these materials, and on the complete J-M Insulation line, write for catalog GI-6A. Johns-Manville, 22 East 40th Street, New York, N. Y.**

## Johns-Manville INDUSTRIAL INSULATIONS

*For every temperature . . . for every service*

# POWER LINES

**Personal notes, items of general interest, the latest from Washington:—all the news that is news in the power field**

In the 15 months since Pearl Harbor, the **electric utility industry** has shown by its performance an inherent strength and character which should give it renewed assurance and confidence, according to **Tom P Walker, president of the Council of Electric Operating Companies,** whose first annual meeting was held in Chicago on March 19. Mr Walker reviewed Council's activities ranging from helping to promote seasonal pooling to acting as **liaison between government agencies and utilities.** Among the outstanding activities of this group was its help in organizing volunteer committees of utility executives to set up regional power pooling, and its assistance to Army engineers in getting personnel for four floating power plants, and to Army and Navy Signal Corps in getting men for radio and construction work. The Council also assisted Selective Service and the War Manpower Commission in drafting **Occupational Bulletin No 9.**

o o o

Electric distribution systems, tailor-made to requirements of individual plants, were recently described as a far-reaching step toward an uninterrupted flow of war materials. **An industrial plant is no stronger than the weakest link in its distribution system,** according to **H G Barnett,** engineer, **Westinghouse Electric & Mfg Co,** who spoke at a meeting of the **Chicago Section** of the **Electrical Maintenance Engineers.** An authority on industrial-plant systems, Mr Barnett has given numerous talks on the subject before engineering groups.

o o o

Cleanup of scrap and obsolete machinery in the 61-year old plant of **L O Koven & Brother,** Jersey City, N. J., has yielded **579,770 lb of metal** for the **nationwide scrap drive.** That is all the scrap needed to make a 500-ton submarine chaser. In addition, company scrapped 60,000 lb of rivets. . . . Instead of storing a considerable tonnage of steel scrap produced in primary shearing operations in the manufacture of switchboard panels, **General Electric Co** now accumulates and sorts all pieces

(*Continued on page* 200)

**Effect of new scheduling procedure** for critical common components was chief subject discussed at the fifth meeting of **Conveyor and Mechanical Power Transmission Industry Advisory Committee** with War Production Board and other Government officials, held recently in Washington.

Representatives of **WPB's General Industrial Equipment Division** explained technical details of **Form PD-900,** which manufacturers must file each month under terms of **General Scheduling Order M-293** which shows production capacity, orders unfilled, received, shipped, cancelled and scheduled. Committee pointed out frequent duplication of data in various required forms and asked for simplification of the industry's paper work.

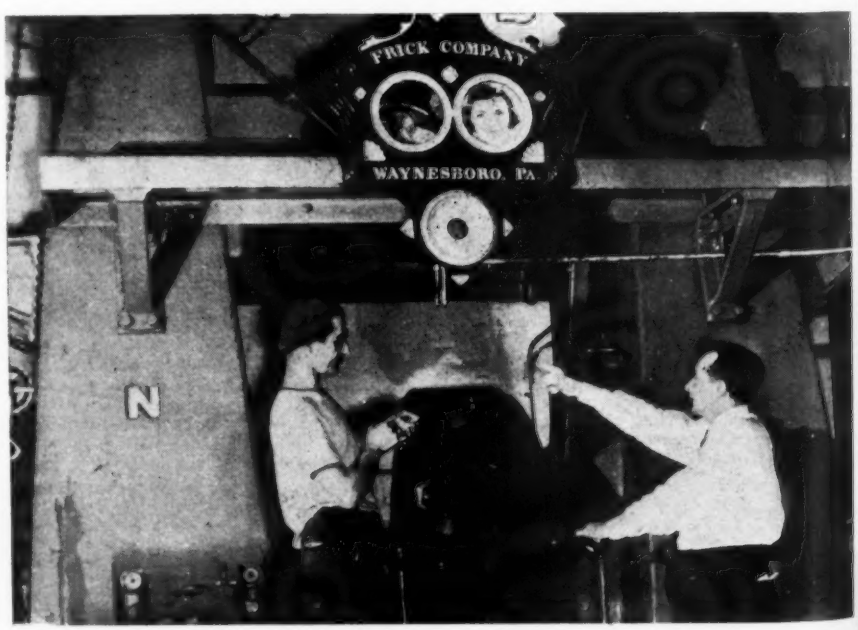
Certain segments of the conveyor and mechanical power transmission industry, particularly speed reducers and gears, **have now reached peak production capacity** and special problems arising from this situation must be faced. Demand for gears has increased to such an extent that a **separate industry advisory committee was proposed for this segment.**

**Limitation Order L-193,** under which the industry has been operating for approximately six months, has been found to be effective and workable. **Production can be maintained,** it was agreed, if the manpower situation does not become tighter than it is at present and if sufficient supplies of materials can be provided.

o o o

**Program for protecting war-production plants** against the "four horsemen" of industrial destruction—fire, accident, sabotage and air raid—was announced recently by **J M Landis, Director of Civilian Defense.** In securing the protection of industrial establishments, the **Industrial Protection Council of OCD** marks an important advance. OCD has been entrusted with the development of a plant-protection program for facilities and installations not owned or operated by the Government or assigned to the responsibility of the War or Navy Departments. This council represents **a united effort on the part of management and labor to assist OCD** in securing protection of production, personnel, property, materials and products from effects of every kind of enemy action.

## THIS STEIN SONG IS ANOTHER TUNE




**After years of cooling beer, this 60-ton ice machine starts the long trek from New England Brewing Co's plant to the land that made beer famous, present home of Adolph Schicklegruber. Caught in the draft of scrap, this hunk of strategic metal will be melted for production of tanks and other weapons to lick Axis**

# THE SCIENTIFIC APPROACH TO YOUR PIPING PROBLEMS

## POWER PIPING FUNCTIONAL HANGERS

This simple type of Functional Hanger fulfills the requirements expressed by 85% of the entire present day use for spring hangers and is particularly adaptable to low headroom conditions . . Functional Hangers are furnished in seven types for every piping installation requirement including shipboard use.

## These standard products save thousands of man hours in Design, Fabrication and Erection of Piping Systems

## VIBRATION ELIMINATORS

Permit swivel action in all directions.

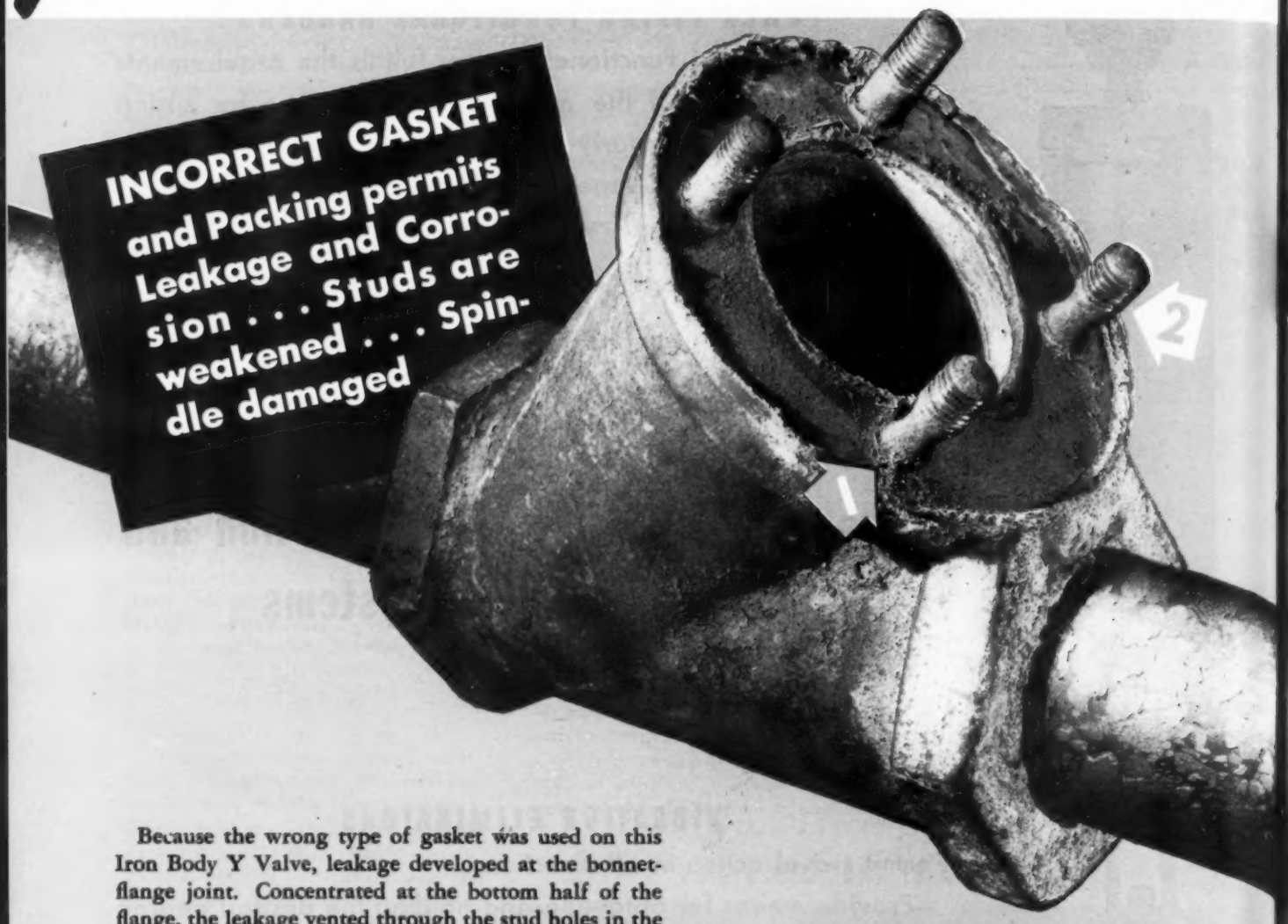
Provide means for obtaining and holding the desired degree of force in opposition to vibration. Operate with a minimum of spring action. Spring tension can be adjusted at will.

***POWER PIPING DIVISION PRESENTS THE ULTIMATE IN ENGINEERING-PREFABRICATION AND ERECTION OF PIPING SYSTEMS***

**BLAW-KNOX COMPANY**
**POWER PIPING DIVISION**
1525 PENNSYLVANIA AVE., PITTSBURGH, PA.

The correlated use of FLEX-ANAL CHARTS and HANGER BULLETIN 1863 saves time in engineering man power which can be devoted to other useful purposes. Copies of these books can be obtained through a request on your business letterhead.

# *Prevent* Valve Failure




Because the wrong type of gasket was used on this Iron Body Y Valve, leakage developed at the bonnet-flange joint. Concentrated at the bottom half of the flange, the leakage vented through the stud holes in the bonnet. The resulting corrosion so weakened the studs (1 and 2) that tightening the nuts to overcome the leakage would eventually have twisted them off. The difficult repair job of replacing these studs would require a complete shut-down of the boilers feeding the line in which the valve was installed, with a resulting interruption in plant production.

Corrosion has also attacked the spindle of the valve (3) because faulty packing allowed leakage at the packing box. These conditions are further examples of destruction that could be easily avoided by proper inspection and conservation measures.

Waste of production hours through preventable valve failure is inexcusable today, since delay in the delivery of war materiel may eventually spell defeat for our armed forces on some distant battlefield. Equally serious is the waste of critical metals by needless destruction of valve parts.

Make sure your valves are inspected regularly, systematically. Repair or replace worn parts before a valve destroys itself. Instruct maintenance workers thoroughly and supply them with the necessary parts and tools. Select valves for new installations carefully; install them properly.

Jenkins Engineers will provide any assistance you need for improving your system of valve conservation. Send details of your present valve problems.

Jenkins Bros., 80 White Street, New York, N. Y.; Bridgeport; Atlanta; Boston; Philadelphia; Chicago. Jenkins Bros., Ltd., Montreal; London.

# JENKINS VALVES

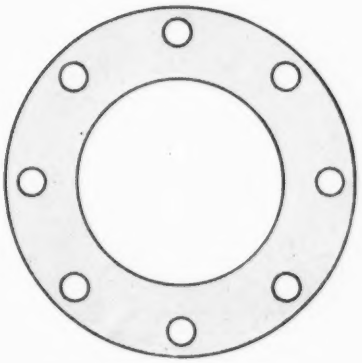
# *before it starts!*

## Selecting the RIGHT Gasket saves Valves . . . avoids Shut-downs for Repairs

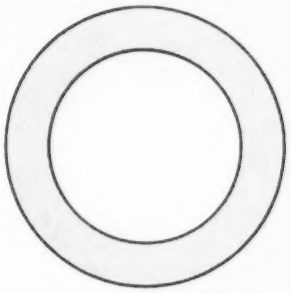
In the valve illustrated, the full face gasket used for the bonnet joint is too soft and too thick for this service. A thinner, 1/16" thick ring gasket of good asbestos sheet packing material would have kept the joint steam tight and prevented destructive corrosion.

The ring asbestos gasket is generally recommended for Iron Body and Steel Valves used in moderately high pressure services, up to about 500 lbs. Full face gaskets are suitable for some lower pressure services, and for use with Bronze Valves.

Thin gaskets are less likely to develop leaks than thick. When soft packing is installed, follow up the bolts, tightening them again after the line has been in service for some time.



**A RING TYPE GASKET**



**A FULL FACE TYPE GASKET**

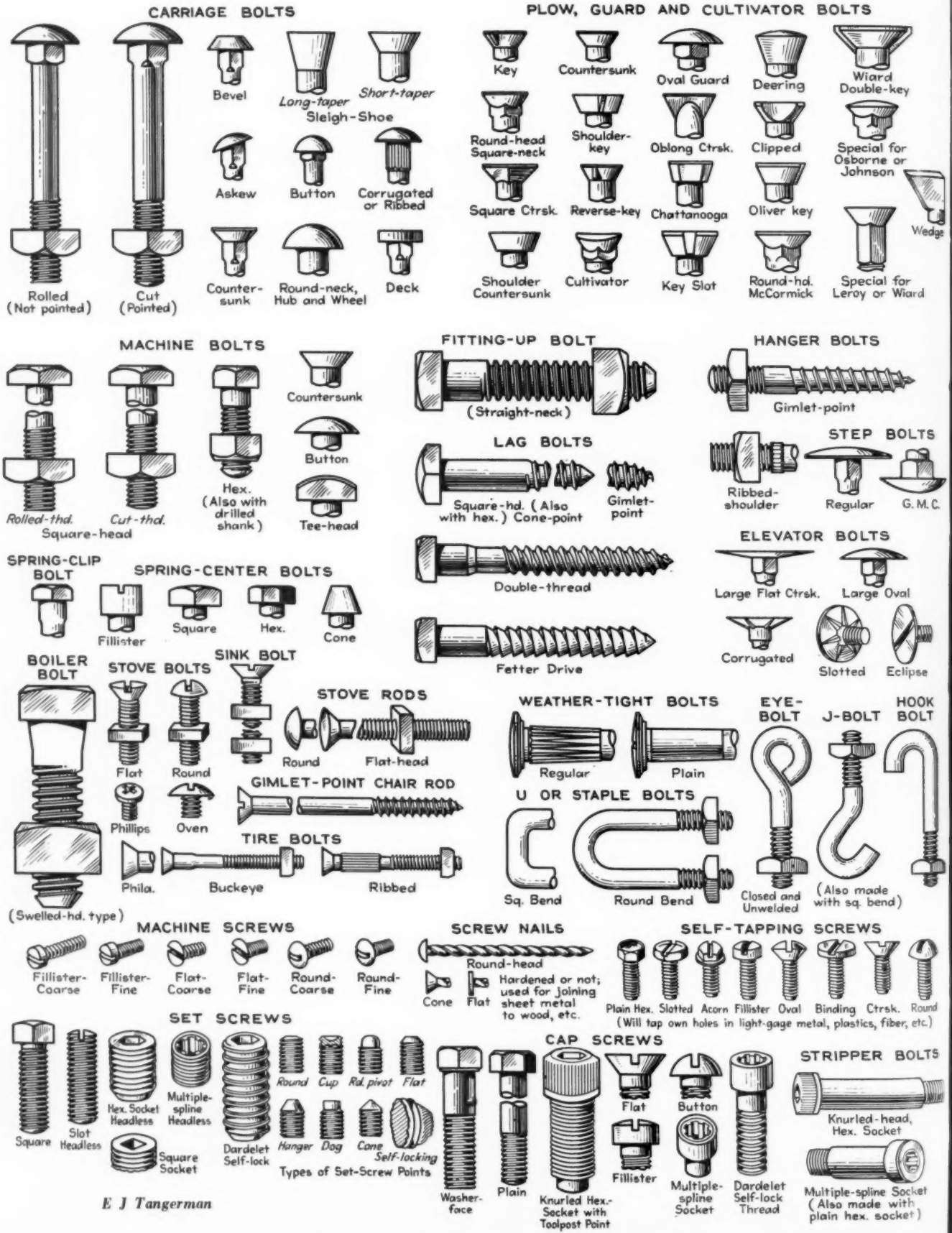
Typical gasket styles for Bronze, Iron Body and Steel Valves are illustrated above. Since Jenkins Bros. are manufacturers of gaskets and packing as well as valves, Jenkins Engineers can give you complete information on the types best adapted for your services.

For every industrial, engineering, marine and power plant service

**BRONZE ★ IRON ★ STEEL**

Number 129

# Typical Bolts, Screws, Nuts and Other Fastening Devices—I




*E J Tangerman*

# PAY ONLY FOR MODERNIZATION CONVERT TO FLOWMATIC

*Just a few companies who have converted older Copes Regulators to modern COPES Flowmatic—the steam-flow regulator*

BARRETT COMPANY
BLANDIN PAPER COMPANY
DETROIT EDISON COMPANY
EASTMAN KODAK COMPANY
GARDNER-RICHARDSON COMPANY
STATE UNIVERSITY OF IOWA
JERSEY CENTRAL POWER & LIGHT COMPANY
JONES & LAUGHLIN STEEL COMPANY
NATIONAL CONTAINER CORPORATION
NEBRASKA POWER COMPANY
OTTER TAIL POWER COMPANY
PUBLIC SERVICE COMPANY OF COLORADO
PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS
PUBLIC SERVICE ELECTRIC & GAS COMPANY
REPUBLIC STEEL CORPORATION
SCOTT PAPER COMPANY
WHEELING STEEL CORPORATION
YOUNGSTOWN SHEET & TUBE COMPANY
DEWEY PORTLAND CEMENT COMPANY
TENNESSEE EASTMAN CORPORATION
SHELL OIL COMPANY, INC.

THE cost of converting COPES Simple Level Regulators to Flowmatic, the 2-Element Regulator, has been kept to a minimum through sound basic design. As specialists in boiler feed water systems, it is our aim to make improvements readily adaptable to our thousands of COPES users.

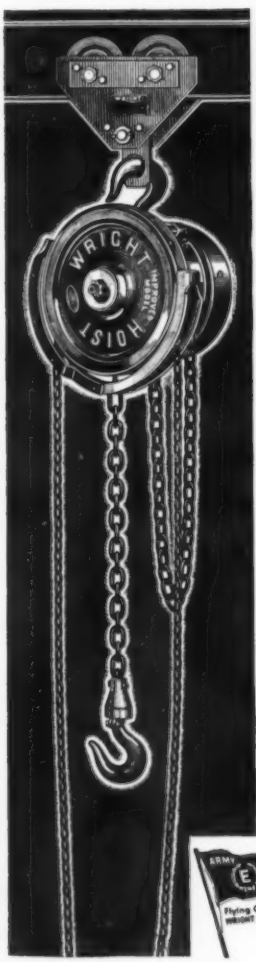
The plants noted at the left are a few that have recently converted to Flowmatic—they paid only for the additional parts and service required.

The simple, sturdy, dependable COPES Regulator can either be made like new again or can be converted into a more modern type COPES unit. The scrap drive will never catch a COPES. If you are an old COPES user you will want to know how to convert to COPES Flowmatic. Write for booklet 429 that tells about Flowmatic, then we can talk about application or conversion.

**NORTHERN EQUIPMENT CO • 531 Grove Drive, Erie, Pa.**
*FEED WATER REGULATORS • PUMP GOVERNORS • DIFFERENTIAL VALVES*
*LIQUID LEVEL CONTROLS • REDUCING VALVES AND DESUPERHEATERS*
BRANCH PLANTS IN CANADA, ENGLAND REPRESENTATIVES EVERYWHERE

OVER 60,000 COPES FEED WATER REGULATORS IN SERVICE

★ GET CLOSER LEVEL CONTROL WITH THE COPES FLOWMATIC ★ REGULATOR
FEEDS BOILER ACCORDING TO STEAM FLOW-AUTOMATICALLY




# OIL REGULARLY!

In these days of shortages we don't need to know how to choose a new hoist—but how to use an old one more efficiently, and how to make it last longer.

So—get busy with the grease gun! Where properly lubricated and maintained, many **WRIGHT HOISTS** have given constant, trouble-free service for 20 and 25 years. We have known other hoists to be so badly abused they were ruined in two years. Your **WRIGHT HOIST** will last indefinitely if you treat it right.

If your hoist is under constant use, as on assembly line work, inspect and lubricate it at regular intervals. If it is subjected to intermittent service, then perhaps lubrication every three months and inspection every six months is sufficient. But keep your load chain well-lubricated at all times. A well lubricated chain will far outlast a dry chain.

Conserve steel, protect machinery and maintain production schedules by regular inspection and lubrication.

*In Business for Your Safety*

**WRIGHT MANUFACTURING DIVISION**
York, Pa., Chicago, San Francisco, New York

**AMERICAN CHAIN & CABLE COMPANY, Inc.**
BRIDGEPORT, CONNECTICUT


## Fuel Rationing

(*Continued from page* 73)

their advertising to the theme of fuel or power saving. In all towns and cities of Britain, electricity and gas showrooms have featured exhibitions showing economy in cooking, heating, lighting and industrial power use. The utility industry received its "Battle Order No. 1" from Comdr Stephen King-Hall, of the Ministry of Fuel and Power, when he said he regarded electricity showrooms all over Britain as his platoon and battalion headquarters in the battle. The industry immediately swung into the attack and issued a wide variety of advisory hints and helpful services.

Although the domestic campaign has been the heart of the fuel-saving program, other gains have played an important part. There is, of course, no street lighting, as the blackout is complete. Shop lighting has been cut to a minimum and no display lighting is permitted. Movie and theater lighting is reduced, and in every case of bulb renewal, a lower-wattage bulb is substituted. Lighting and heating consumption of churches, clubs, apartment houses and similar premises has been handled by special regulations.

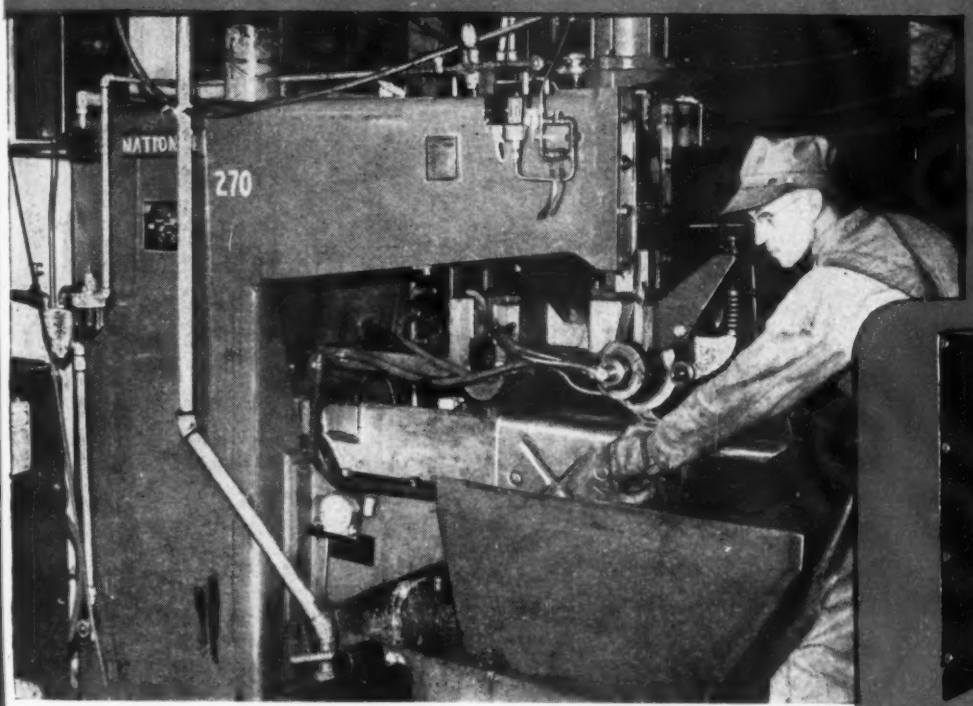
Greenhouse heating has been banned except for food growing. Only one room in each home is supposed to be used at one time, although this is a ruling that cannot be enforced. Special charges made when a consumer failed to use the specified minimum of electricity and gas have been withdrawn and payment is now made on straight consumption. Special advice has been issued educating the public to read meters so they can watch their target regularly and check their consumption.

So much for the drive aimed at domestic and commercial consumers; industrial users have been treated similarly. If a plant is still in business, it follows that it is on war work because no factory in Britain is permitted to continue unless it is 100% on vital production. Thus, industrial consumption of power and fuel may be considered essential.

The drive in industry is to confine power and fuel consumption to the minimum needed to get work done. Experience shows that the greatest fuel-saving possibilities lie in prevention of waste rather than in large-scale plant improvements. In every case, plant engineers have been called on to study

# TO REDUCE KVA DEMAND OF RESISTANCE WELDERS

## USE G-E PYRANOL CAPACITORS



Series-capacitor equipment for improving power factor of resistance-welding machines

The Conco Engineering Works, Mendota, Ill., reduced the kva demand of this welder from 150 kva to 54.6 kva by installing series capacitors (partly shown at left). A serious wiring and power-factor problem within the factory was solved, and a bad light flicker in town was eliminated. The capacitors added only 14 per cent to the installed cost of the welder.

### PROBLEM

Welding loads present a problem to both resistance-welding machine users and utility companies. First, because the power demand is high, and the power factor is low. Second, the load is single phase, causing unbalance on polyphase systems. Third, the duty is highly intermittent, causing light flicker.

### SOLUTION

Capacitors can be used in series with the primary of the welding transformer to reduce kva demand from the line by improving power factor to approximately unity.

### RESULTS

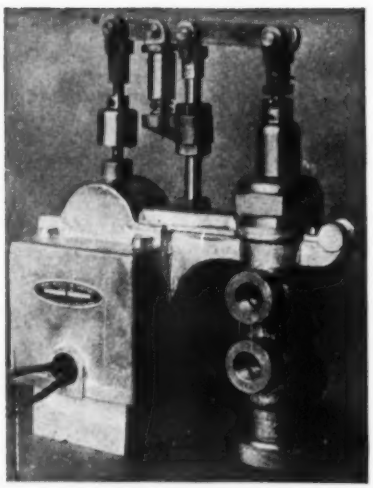
- **More welding machines can be used on an existing feeder.**
- **Heavier welds are possible on the feeders where capacitors have been installed.**
- **Reduced interference with other welders on the same feeder.**
- **Welding machines can be installed on feeders too small to supply the usual low-power-factor machines.**
- **Removal or lessening of the restrictions sometimes imposed by power companies.**
- **Reduction of light flicker.**
- **Smaller feeder and power-supply equipment are needed for new welders.**
- **The necessity of running a separate feeder for a welder can probably be avoided.**
- **Special, low-impedance, power-supply transformers are not necessary.**
- **Long-throat machines will have practically the same kilowatt demand as short-throat machines.**

*Application information can be obtained by asking for Bulletin GET-1134. For specific recommendations call your G-E representative. He'll be glad to help you. General Electric, Schenectady, N. Y.*

**GENERAL ELECTRIC**

407-64-5700

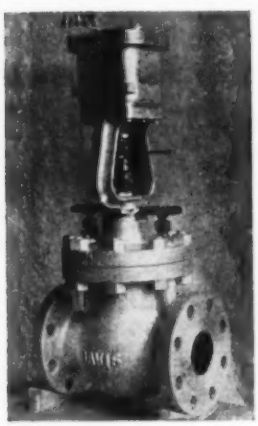
# AUTOMATIC DISTANT CONTROL VALVE OPERATION FOR ANY JOB



*Above—No. 380—a 3 or 4-way pilot valve widely used on air or liquid actuated power cylinders.*

## DAVIS SOLENOID VALVES

*Above — No. 93 — single seated, pilot operated, general purpose valve.*



*Above—No. 93-H with solenoid operated pilot valve and hydraulically actuated main valve built for use on a 400 lb. pressure water main*

STANDARD Davis solenoid valves are available for steam, air, gas, water, oil and viscous liquids in a range of sizes from 1½" to 12" and for pressures up to 1500 lbs. They can be operated by any device which will make or break an electrical circuit. They may be either normally open or normally closed design. Solenoids can be housed in explosion proof boxes where required.

If you have a solenoid valve application, Davis engineers will be glad to give complete recommendations on the right valve for the job. Literature available on request.

●

DAVIS REGULATOR COMPANY
**2540 S. Washtenaw Ave., Chicago, Illinois**

DAVIS VALVES **DAVIS REGULATOR COMPANY**


conditions and advise how to operate each part of a plant on less power or fuel and without loss of output. To their credit, they have proved equal to the task.

In most plants and industrial buildings a Fuel Economy Officer is appointed, known colloquially as the "waste chaser." He is generally a skilled electrical engineer but he may be a staff member without technical training. He tours the plant regularly and pins responsibility for waste on either management or workers—wherever the actual fault lies.

Ads and articles in industrial magazines, stickers on switches, and similar propaganda—all tell the story of fuel economy in industry. Works committees, made up of managers and workers, have achieved excellent results by disciplining workers or managers who are careless.

On the technical side, lighting systems have been thoroughly overhauled and cleaned, blackout devices re-arranged to slide open during daylight, building walls painted to give better reflection, and, in some cases, general lighting has been replaced by more economical local lighting. Savings up to 40% have resulted from installation of automatic heating-system controls in many plants.

### *Fuel Supplies*

While the consumer explores every possible economy in use of fuel and power, producers do their best to increase the supply and to operate efficiently. The greater volume of Britain's power supply comes from coal-burning plants. To allow power stations to operate at maximum capacity, the Mines Dept provides priority fuel supplies. This plan permits the stations to produce steadily with assured fuel reserves, making them independent of supply interruptions which might otherwise affect reliability.

But this priority system does not allow waste, and even in power-production plants economies like those of industrial plants are the order of the day. This means careful attention to equipment maintenance and operating methods that insure highest efficiency.

Britain's power system operates now at about its capacity limit. Wartime conditions make expansion difficult and new coal-burning plants would only further strain the fuel situation. That the government is aware of this aspect is shown by the decision this past month to start at the earliest possible date on a scheme to utilize the vast waterpower of the Scottish Highlands. The import-

NO. 5 OF A SERIES

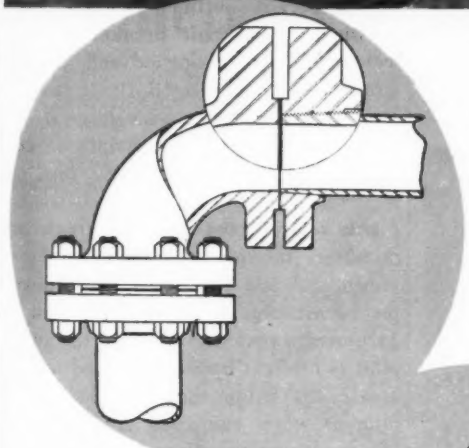
HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

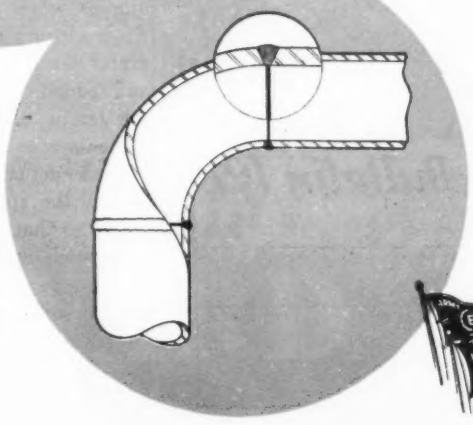
The FIRST WELDING FITTINGS 1ST AND STILL THE BEST

# STOP

**war production delays due to leaks and other avoidable piping troubles**

# WELD WITH TUBE-TURN WELDING FITTINGS





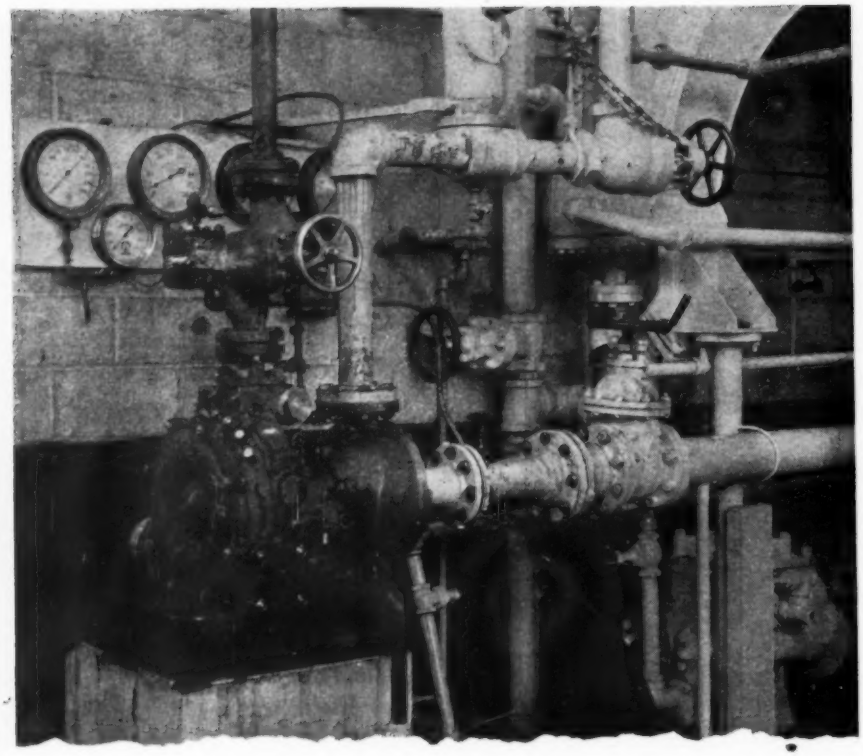
Contrast these diagrammatic drawings and enlarged cross-sections of a flanged ell (*above*) and a Tube-Turn 90° welding elbow (*below*) in a line. Note how the *welded* connection forms virtually a continuous tube without joints. Welding with Tube-Turn fittings *eliminates* the many maintenance headaches inherent with mechanically connected piping: leaks, gasket changes, bolt tightening, caulking, threading, difficult covering, and other inefficiencies that can seriously hamper war production.

REMEMBER these common-sense facts before you install new piping systems or replace old sections: welding with Tube-Turn fittings insures *permanently leakproof, trouble-free joints* and better fittings that last as long as the pipe itself. You banish many maintenance troubles which seriously interrupt the vital *piping arteries* that keep war plants going.

In addition, Tube-Turn welding fittings give you *greater strength and safety;* uniform wall thickness, for *easier, faster alignment and welding;* compact piping layouts that *save space, weight and installation time;* smooth inner walls that mean far *better flow, less corrosion* and *greater piping efficiency.*

TUBE-TURNS (INC.), LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. *Distributors in principal cities.*

**TUBE-TURN**
TRADE MARK
*Welding Fittings*



COFFIN-Steam Turbine CENTRIFUGAL PUMP

Gets Its Physical Examination

Like the civilian entering the armed service every Coffin pump is given a thorough and accurate checkup before leaving for its war job.

We use engineers instead of doctors, a Tachometer instead of a Stethoscope, but the results are the same—a 1-A rating for active service, according to the specifications.

No examining board could be stricter than the Coffin Test Rack on the qualifications demanded.

The test is your assurance that Coffin Steam Turbine Centrifugal Pumps are physically fit to perform the job for which they are specified.

Mail the Coupon

Why not recruit them for your production Army? They serve equally as well on either land or sea.

PRESSURES TO— 750 LBS. SQ. IN.

DELIVERIES TO— 500 G.P.M.

THE J. S. COFFIN, JR., COMPANY
ENGLEWOOD, NEW JERSEY

*Please Send Descriptive Bulletin I-21*

NAME

COMPANY

ADDRESS

P.W.

ance attached to this project is shown by the guarantee given by Parliament. A sum of nearly $150,000,000 has been promised to assist in what will be one of the world's major hydroelectric developments.

In these ways we, in Britain, are attempting to conserve our natural raw coal reserves and to create a source of natural power to help bridge the gap between war demands and war supplies of power. Of course, extension of the power supply offers no immediate gain, and so for us in the battered and battling island, economy in use of existing sources of supply forms the main job of the day. The methods reported in this short article, and many hundreds of similar small savings, are all designed to that end and there can be no doubt that, in total, the saving is colossal. It can be claimed, too, that we who were once a profligate nation as far as power wastage and fuel carelessness were concerned are now one of the most fuel-conscious nations.

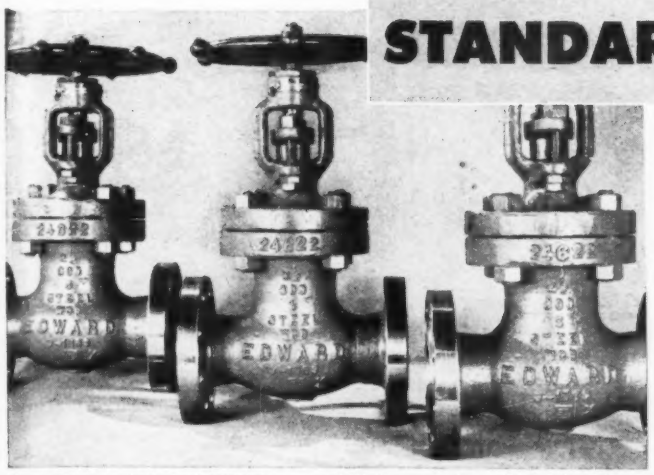
## AC Generator

(*Continued from page* 75)

in turn, which energizes the lamps *TL* of the test unit. Note which lamp is bright and which is dim. Test the synchroscope as outlined in the motor method. The circuit breaker and disconnects are next opened and the generator leads reconnected. Bring the generator up to speed and voltage. If the same test lights *TL* are bright or dim, as when energized from the bus, the generator can be paralleled. If the lights are reversed as to brightness and dimness, the generator must be shut down and any two leads interchanged between the generator and the first instrument transformers. When the generator is brought up to speed and voltage again, the lamps should be briught or dim as when energized from the bus. After closing the disconnects, the generator can be paralleled with the system and loaded. At the first convenient time, the lamps and inductance are disconnected.

In the actual synchronizing operation, control the speed of the incoming generator so that when the synchroscope is connected, the indicator requires about 15 seconds to make one complete revolution, or one-half revolution for the GE synchroscope with the double-end indicator. This is necessary to allow for unexpected speed changes of the in-

# Cut Delivery Time with These STANDARD EDWARD VALVES



It pays to use Edward 300 lb sp steel globe, angle and check valves. Note strong, functional design of 2½ in. cast steel globe stop valves above. Fully guided disk permits installation in any position.

Choosing these standard Edward valves means quicker delivery. But important as that is today, there are other big dividends—such things as maximum job and part interchangeability, easier installation and other time saving factors.

Built with the customary Edward emphasis on "plus value" construction, these versatile forged and cast steel valves fit a wide variety of power, petroleum, process piping and industrial services. For more detailed descriptions and dimensions see Edward Catalog No. 101. If you haven't a copy, a post card will bring you one by return mail.

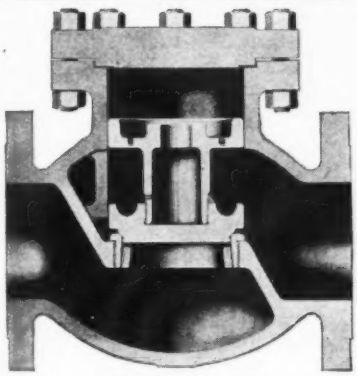


Fig. 6597—Horizontal

## CAST STEEL CHECKS . .

For 300 lb check valve service, choose Edward Fig. 6597 (horizontal) or Fig. 6598 (angle). Cast steel, piston type, flanged ends, sizes 2½ in. to 12 in. Integrally cast ribs guide disk-piston assembly throughout travel. Streamlined bodies contoured for free flow. Also built for pressures to 1500 lb and in sizes to 12 in. Forged steel check valves, ¼ in. to 2 in. available.

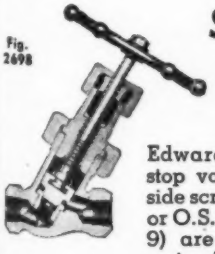


Fig. 2698

## SCREWED STOP VALVES

Edward screwed end stop valves, either inside screw (Fig. 2698-9) or O.S. & Y. (Fig. 2688-9) are going into all sorts of service today. Full area forged steel bodies minimize pressure drop. EValloy seats and disks. Drop tight closure. Globe and angle, for 600 lb sp in sizes ¼ in. to 2 in.

## FLANGED STOP VALVES . .

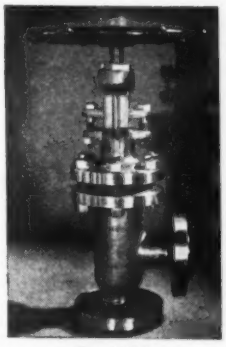
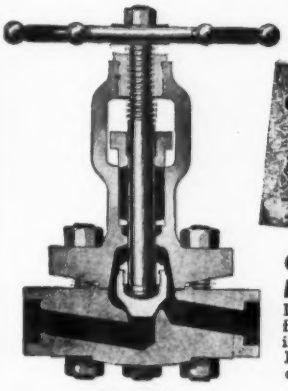


Fig. 4829

There's long, economical life in Edward globe and angle forged steel flanged end stop valves. Seats, disks and stems are EValloy, Edward's specially processed stainless steel. Unique swivel plug type disk design prevents galling. Heat treated forged steel bodies proportioned to reduce distortion under heat. O.S. & Y. with bolted bonnets and bolted glands. For pressures to 600 lb sp, sizes ½ in. to 2 in. Same design characteristics available in valves for service to 1500 lb.

## INTEX GLOBE STOP VALVES . .



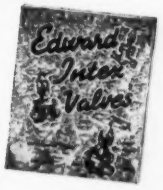



Fig. 3264

**GET THIS FOLDER!** Intex valves are fully described in Catalog 12-G5. Write for a copy today!

Disks and integral seats of these Edward Intex valves are hard surfaced with Stellite. Disassembly unusually easy, working parts readily accessible. Socket welding, flanged or screwed ends for pressures to 1500 lb at 950 F.

## BLOW-OFF VALVES . . . .

Edward blow-off valves are designed to avoid damaging shock to piping. Simple, frill-free construction with no unnecessary parts to erode or cause clogging. EValloy and Stellite seats and disks. Globe type seating for tight closure. Straightway and angle for 150 to 1500 lb sp service.

**THE EDWARD VALVE & MFG. CO., INC.**
**1220 W. 144th STREET • EAST CHICAGO, INDIANA**

**EDWARD Steel CAST AND FORGED VALVES**

# *Telescope* TIME

## ON YOUR POWER PIPING

If power piping fabrication is your problem and time is a menacing factor, call Associated. Saving time on high pressure, high temperature jobs without sacrificing a jot of quality is our business.

Serving all industries where high pressure, high temperature piping is required, Associated has improved constantly all welding procedures through application of modern preheating, stress-relieving equipment. For example, the photograph above shows welding operation on one nozzle of a carbon moly header, on which pre-heating temperature is being maintained, while at the same time the other nozzle is being stress-relieved. Equipment shown in background is capable of maintaining preheat and/or stress-relieving operations on four welded joints at once. *Let Associated Handle Your Job.*

**WAR PRODUCTION**...This company is engaged in high priority war production... proud of its responsibilities and fulfilling them to the letter.

ASSOCIATED PIPING & ENGINEERING COMPANY
2332 EAST 38TH STREET
LOS ANGELES, CALIFORNIA



coming generator or of the system, so that the oil circuit breaker will not be closed after the synchroscope passes the in-phase position. If this position is passed before the oil circuit breaker closes, the generator must be pulled back against its rotation to bring it in phase with the system. Closing the oil circuit breaker shortly before the synchroscope pointer arrives at the in-phase position permits rotation of the generator to help pull it in step with the system.

The synchroscope dial markings *slow* and *fast* indicate the speed of the incoming generator relative to the system. The lamps check the synchroscope's operation. When they are brightest, indicator is at its maximum distance from the in-phase position. As the indicator approaches, they grow dim and when the pointer is on the mark they are out. As the generator is being synchronized the voltage should be regulated until it is very close to that of the system. This, with care in closing the oil circuit breaker properly, prevents system disturbance by the new generator.

Once the generator is on the system, it is ready for load. Start with only 10 to 20% of full load, and run until sufficient time has elapsed to show that the complete unit is operating satisfactorily. The load can then be increased, step by step, as over-all operation of the unit is satisfactory until full load is carried. During the preliminary runs it is well to have additional capacity on the system to allow for a quick shutdown of the new unit, and still carry the load.

Part of the preliminary load test includes checking, testing and adjusting the voltage regulator. This is done by the manufacturer's service engineer or by following the instructions furnished with the regulator.

## Larger V-Belt Sheaves

(*Continued from page* 80)

diameter of the sheave and keeping belt speed constant, horsepower practically doubles.

Normally, the speed of the driving sheave remains constant at about 875, 1150 or 1760 rpm for 60-cycle motors. At constant driving-sheave speed, the belt's speed increases with sheave diameter. For example, a 7-in. sheave running at 1150 rpm gives a belt speed of about 2000 fpm. As previously mentioned, a C-cross-section belt is good for 3.7 hp on a 7-in. sheave. If we use a 12-in. sheave, belt speed at 1150 rpm

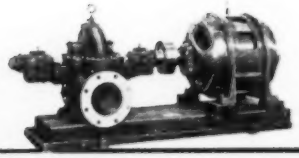
# Chapman List 960

## "PULLS ITS OWN FREIGHT"

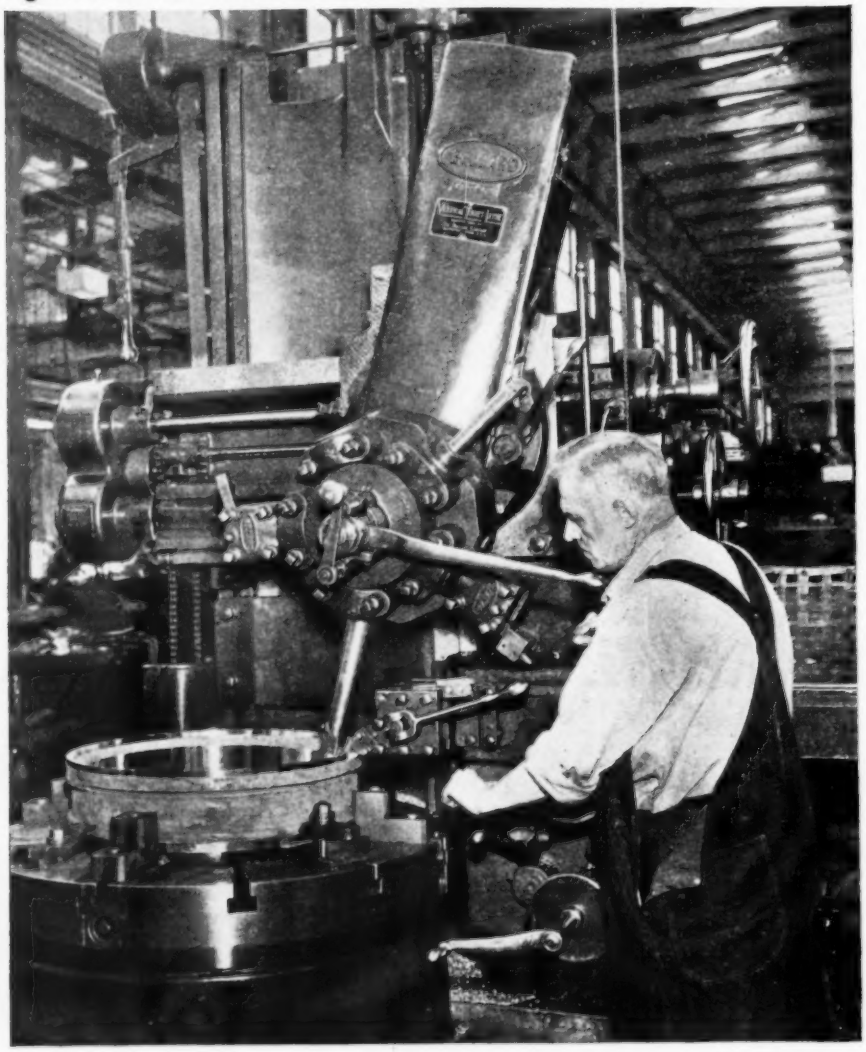
## Longer than any Similar Small Valve

This is the biggest hunk of small valve you can get for your money *anywhere.* Standard seats and plugs are made tough enough to beat out any other small valve on the long pull . . . without repairs and replacements along the way. And if your service is tougher than the ordinary, then you can get List 960s with plugs and seats super-hardened by an exclusive Chapman process. Standardize on this long-lived forged steel gate valve for all lines from ¼" to 2" . . . for all pressures up to 800 lb. at 750° F., or up to 1500 lb. cold working pressure. Get in touch today, and get the small valve that goes in *to stay.*

THE
**CHAPMAN VALVE**
***Manufacturing Company***
INDIAN ORCHARD, MASSACHUSETTS



**Fighters on the WARREN PUMP Production Front . . No. 2 of a Series**



## HENRY TOOK A GUN TO FIGHT THE KAISER . . . NOW HE'S FIGHTING HITLER ON THE WAR PRODUCTION FRONT

**Meet Henry Forrant . . . another patriotic American and skilled pump maker, who, for many years has been helping in the construction of Warren Pumps, built without compromise, to fit the job.**

**In the last war, Henry did his part on the battle field. Now, he is putting all his skill and effort into the Battle of Production . . . joining with other Warren employees to see all Warren equipment will continue to live up to their long established traditions for reliability in war-time as in peace . . . whether their duties take them to war work or sea duty.**

**Just as you can always count on Warren Pumps to come through under the toughest operating conditions, you can count on the entire Warren organization to help in every possible way to bring Victory to our cause.**

# WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS



increases to 3600 fpm and the belt's rated horsepower goes up to 11.2. Therefore, simply by increasing the sheave's pitch diameter from 7 to 12 in. increases rated horsepower three times.

Figs. 2 and 3 further serve to illustrate the possibilities of increased sheave size. Fig. 2 shows a 3-in. sheave belted to a 12-in. one, with three A-section belts, such as would be used to connect a 2-hp 1750-rpm motor to its load. A 3-in. sheave at 1750 rpm gives a 1360-fpm speed, at which each belt has a rating of 0.9 hp, or a total of $0.9 \times 3 = 2.7$ hp. Fig. 3 shows the same drive as Fig. 2, but uses a 3.8-in. and a 15-in. sheave. These sheaves increase the belt speed to 1670 fpm, with a normal rating of 1.4 hp. This makes it possible to replace three belts with two that have a total capacity of $1.4 \times 2 = 2.8$ hp.

Because of reduction in the number of belts required to transmit a given load, the larger sheaves often weigh and cost less than the smaller ones. For example, the 3.8-in. sheave, in Fig. 3, besides containing about 0.5 lb less cast iron than the 3-in. sheave, in Fig. 2, also requires less machining and costs less. Because the belts bend less sharply in traveling around the larger sheave, their life is increased.

Few setups are found where sheaves of recommended diameters cannot be installed in the space available. None of the recommended sheave diameters produce a belt speed above 5000 fpm, the speed at which centrifugal force acting on the belt begins to reduce its capacity.

Of course, the belt's higher speed tends to faster wear, but of far more importance is the increased life obtained from flexing the belt around the larger-diameter sheaves. This cancels out several times any decrease in life because of higher speed. Thus, the sheave diameter increases of the *new* plan should not be regarded as temporary expedients for wartime rubber conservation alone. The increases are based on sound engineering practice in line with a long-range trend toward larger-diameter sheaves.

## Boiler Feed Pumps

(*Continued from page* 87)

eration of both turbine and pump must be checked. The turbine may have to be renozzled for the greater steam flow, and the inside of the pump may require changes.

Were pump No. 2 motor driven, its

# IT BETTER BE *NEW*— AND *NEWS*

*This is new. And it's NEWS for every post-war planner. World's largest fractionating tower. It's all-welded. Sets a NEW high in fit-up tolerances and fractionating efficiency—a NEW low in oil refining cost.*

**ALTER EGO:** Yes—and a NEW high in construction savings. Tower shell costs 30.7% less, weighs 15% less. Trays cost 30% less, weigh 54% less—because of arc welded construction.

*That's the post-war pattern! The NEW product must be a better product at less cost. Be it vacuum tower or vacuum cleaner the NEW product must obsolete the old models. Otherwise it's a sales dud.*

**ALTER EGO:** Right! To build metal products that will win post-war sales we've got to think about how WELDING is now building the ADVANCED fighting equipment for winning the war.

*That IS something to start this post-war thought: Since we will have to fight WITH or AGAINST new models, let's plan the NEW by finding out from Lincoln what's NEW in arc welding—and how to apply it.*

**Ask your inner self whether old models will SELL after the war.**

**THE LINCOLN ELECTRIC COMPANY**
**CLEVELAND, OHIO**

*then I said to myself—*

**WELDING IS THE TOWER IN POST-WAR DESIGNS**

## HOW TO PROTECT YOUR BOILERS FROM

# OXYGEN CORROSION

## WITH NO DANGER OF FOAMING

No power engineer can afford to take unnecessary chances on a shutdown for repairs these days. Yet even in power plants protected by efficient mechanical deaeration or where distilled water is fed into the boiler system, there is always the danger that overloads or leakage of air into the system may cause oxygen corrosion.

*Your best protection against that danger is continuous treatment of your boiler feed water with Santosite (sodium sulfite).*

An anhydrous, crystalline product, Santosite is easy to handle, store and apply. About thirty parts Santosite per million parts water maintained in the system at all times assures protection, and one simple test gives an accurate check on the concentration present. Periodic tests will not only enable the maintenance of the desired Santosite content, but will also reveal changes in oxygen influx. A new leakage into the system will be shown by an abrupt drop in the Santosite concentration.

Depending on the oxygen content of the feed water, costs of continuous dependable protection against oxygen corrosion vary from $0.05 to $0.65 per million pounds of boiler feed.

For samples of Santosite and full details on its application to your boiler system, write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, St. Louis, Mo. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Los Angeles, San Francisco, Montreal, Toronto.

MONSANTO CHEMICALS

"E" FOR EXCELLENCE—The Army-Navy "E" burgee with two stars, "representing recognition by the Army and the Navy of especially meritorious production of war materials" over a two-year period flies over Monsanto.

SERVING INDUSTRY . . . WHICH SERVES MANKIND


speed could not be increased to deliver the additional flow at higher pressure. If difference in service pressures is small, it may be possible to increase the head developed by installing new impellers. They, in turn, may require remotoring to furnish greater power. In every case, of course, a pump and driver designed for higher pressure can be used on the lower-pressure system, provided the difference in pressure is not greater than can be handled by the boiler feedwater regulators, or excess-pressure regulators installed for the purpose.

Rebuilding a motor-driven pump for higher pressure may be expensive or even impracticable. If so, it may be possible to install a motor-driven booster pump, Fig. 4, to raise the standby pump's suction pressure, provided the latter is otherwise suitable for the service required. For the assumed conditions, added head is required only when the standby pump is supplying No. 2 boiler so that the booster pump is piped in only on No. 2 feed line, as shown. Assuming the pressure difference just outlined, the booster pump would have to develop approximately 250-ft head and would require a 100-hp motor.

### *Check for Pressure*

If a booster pump is to be installed, the standby boiler-feed pump must be checked to see whether it can take the higher suction pressure. Such added pressure usually affects the stuffing-box performance and it may be that only slight adjustments in this part of the pump's construction are needed to accommodate the new operating conditions.

When handling water at higher temperature than that for which a standby pump was originally designed, its materials should be checked for proper operation. A bronze-fitted construction suitable for 240 F, for instance, might be acceptable for occasional short emergency periods but generally unsatisfactory for continuous service at 320 F.

In some installations, adjacent generating units operate at considerably different pressures. In general, high-pressure boilers and their accompanying feed pumps are in relatively better condition than older low-pressure pumps. For this reason, it is sometimes advantageous to make provision for feeding the low-pressure boilers from the newer high-pressure pumps by (1) an interconnecting pipe with pressure-reducing valve or (2) an outlet from an intermediate stage of one or more of the high-pressure pumps.

The pressure-reducing valve arrangement is not the most economical from

# RATING INCREASED BEYOND PRESENT LIMITS

## "Pinwheel Action"

### A NEW GAS BURNER PRINCIPLE — PERMITS GREATER HEAT RELEASE PER CUBIC FOOT OF FURNACE VOLUME

Coppus-Dennis FANMIX Gas Burner utilizes the Dennis principle of combining gas with air in a perfect ratio. "Pinwheel Action" produces complete combustion without impingement — truly "radiant heat". A constant temperature exists throughout the furnace; no drifting hot-spots.

One simple change in your equipment — installation of FANMIX — will give you the extra thru-put you are undoubtedly looking for.

And here's real efficiency. With Coppus-Dennis FANMIX Burner, typical flue gas analysis shows over 11% $CO_2$, a fraction of 1% of $O_2$, no trace of CO., when burning 1000 B.T.U. natural gas.

### "PINWHEEL ACTION" FOR PERFECT MIXTURE

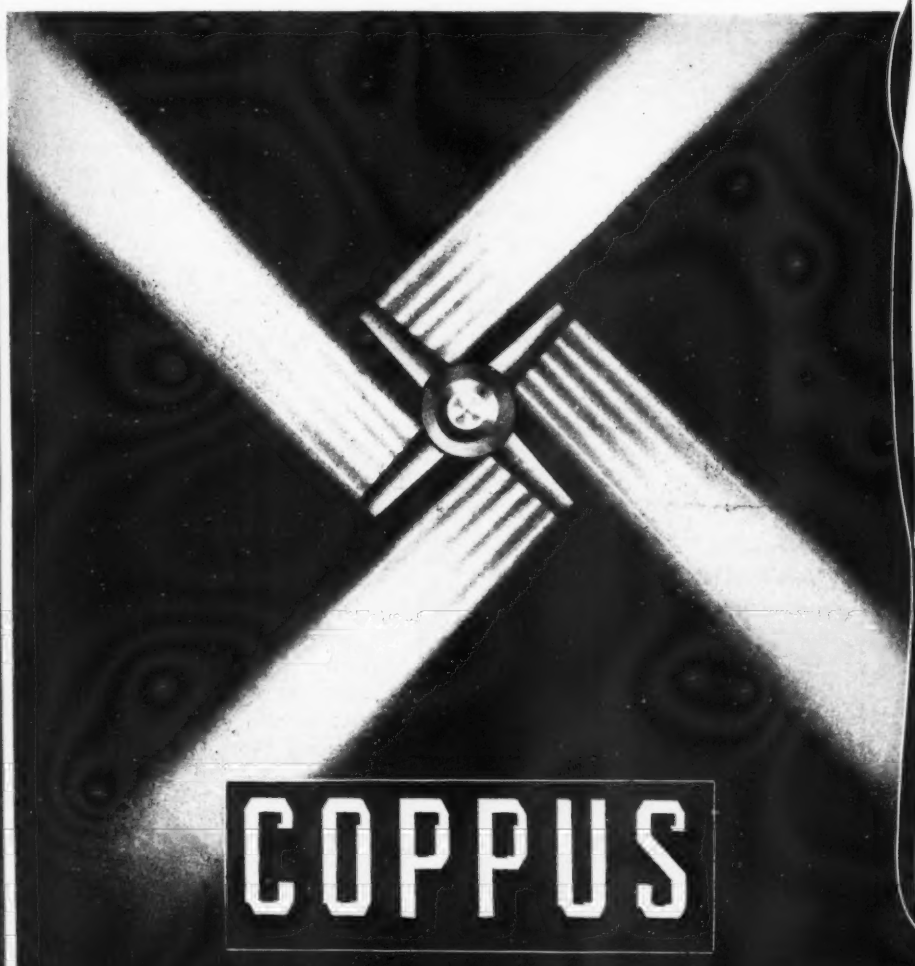
The energy in gas under pressure does the work. Gas escaping from radially-spaced orifices in driving arms, rotates the fan; this in turn causes intake of air at right angles to the path of the gas. Gas and air are thus mechanically mixed in correct proportions for complete combustion.

### GREATER HEAT RELEASE PLUS!

Bulletin 410-3 describes other FANMIX advantages: — smaller combustion space, less stack, no forced draft equipment needed, no cracking of wet gas, because driver arms stay below "cracking" temperature. A Coppus "Blue Ribbon" product — precision-engineered, precision-built.

**COPPUS ENGINEERING CORPORATION**
305 Park Avenue, Worcester, Mass.

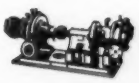
Sales Offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEETS' CATALOG



**You'll get valuable ideas from these free bulletins on other Coppus Blue Ribbon Products**

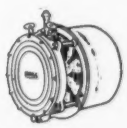
*(Check the ones you want)*

☐ Coppus Cable Manhole and Tank Ventilators. For confined working spaces. Bulletin 163-1.

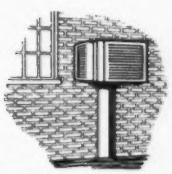


☐ Coppus Steam Turbines. 6 sizes (and prices) from 150 H.P. down to fractional. Bulletin 135-9.

☐ Coppus Heat Killers. Keep production up by keeping men cool. No stale air recirculation. Air is directed. Bulletin 160-5.



☐ Coppus Type C Turbo Blower. For undergrate draft. Bulletin 145-6.



☐ Coppus Air Filters. For engines and air compressors. Perfect, uninterrupted filtration. Bulletin F-310-4.

☐ Coppus-Dennis Fanmix Gas Burner (described in this ad).

Name .....

Company .....

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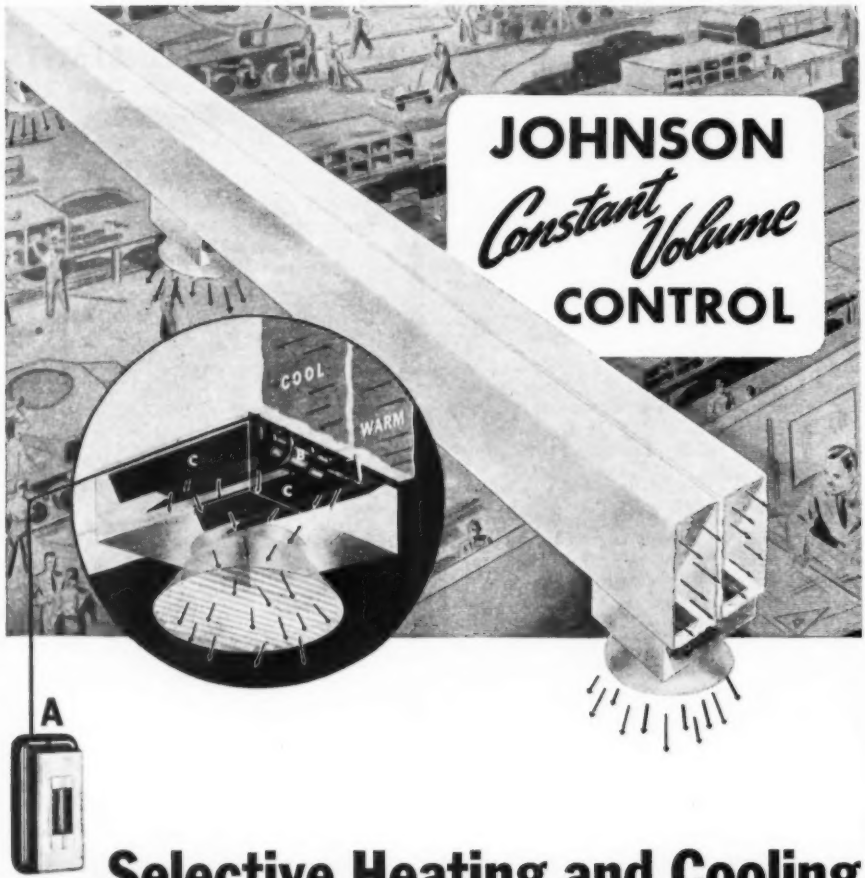
**COPPUS**

**COPPUS BLUE RIBBON PRODUCTS DESIGNED FOR YOUR INDUSTRY . . . ENGINEERED FOR YOU**




# Selective Heating and Cooling
## FOR ADJACENT WORK SPACES

CONSTANT air volume, combined with accurate temperature control! Work-spaces, and other rooms in war production plants—and in all industries—each have different temperature requirements. "Constant volume" systems of heating and ventilating—or air conditioning—with Johnson automatic control, allow adjacent areas to be heated or cooled to different temperatures.

Illustrated above, a double "trunk-duct" carries both warm and tempered air to a mixing chamber at each of the outlets. In some cases, warm air is supplied by one section of the duct and cool air by the other, allowing simultaneous heating or cooling of adjacent spaces. Johnson Control, at each outlet, consists of a *Gradual-Acting* Thermostat (A) controlling a *Long-Travel, Piston-Type* Damper Motor (B) which operates a pair of *Proportioning* Mixing Dampers (C). In the main "trunk-duct", Johnson Static Pressure Regulators control dampers to maintain automatically the proper resistance pressure.

This is another problem solved best by Johnson thermostats, with *adjustable sensitivity*, permitting the whole control system to be balanced precisely. Ask for descriptive bulletins or call a Johnson engineer.

★

**JOHNSON CONTROL SERVES WAR PRODUCTION PLANTS**

For speedy, trouble-free War Production, machine parts must be measured with temperature-calibrated instruments. Curing rooms, test chambers, dryers, dipping tanks, kilns, vats, and coolers must be held at correct temperatures. That's why Johnson Control is on active duty in many War Production Plants.

**JOHNSON**
*Automatic* TEMPERATURE AND AIR CONDITIONING *Control*

JOHNSON SERVICE COMPANY, MILWAUKEE, WIS. & BRANCHES IN PRINCIPAL CITIES

the standpoint of power consumption, particularly if the pump is motor driven at constant speed. However, the low-pressure boilers would be supplied from the high-pressure system only in emergency and for relatively few hours a year. Little new equipment is required and initial cost is low.

Tapping the high-pressure pump casing at some intermediate stage that develops sufficient pressure to feed the low-pressure boiler results in an arrangement of suction and discharge piping as in Fig. 2, except that "take-off" connection for Unit No. 2 comes from an intermediate pump stage, and an additional check valve is installed just ahead of valve *D*.

When feeding the low-pressure boilers, the final stages of the high-pressure pump are operating against a closed valve. Overheating the pump must be prevented by a recirculating hypass, connected to the discharge line ahead of the check valve and leading back to the pump suction. Since such recirculating lines are often provided on high-pressure pumps to protect against overheating at low loads, it is only necessary to provide the line with interconnections and valves to direct the recirculated water back to whichever direct contact heater is operating.

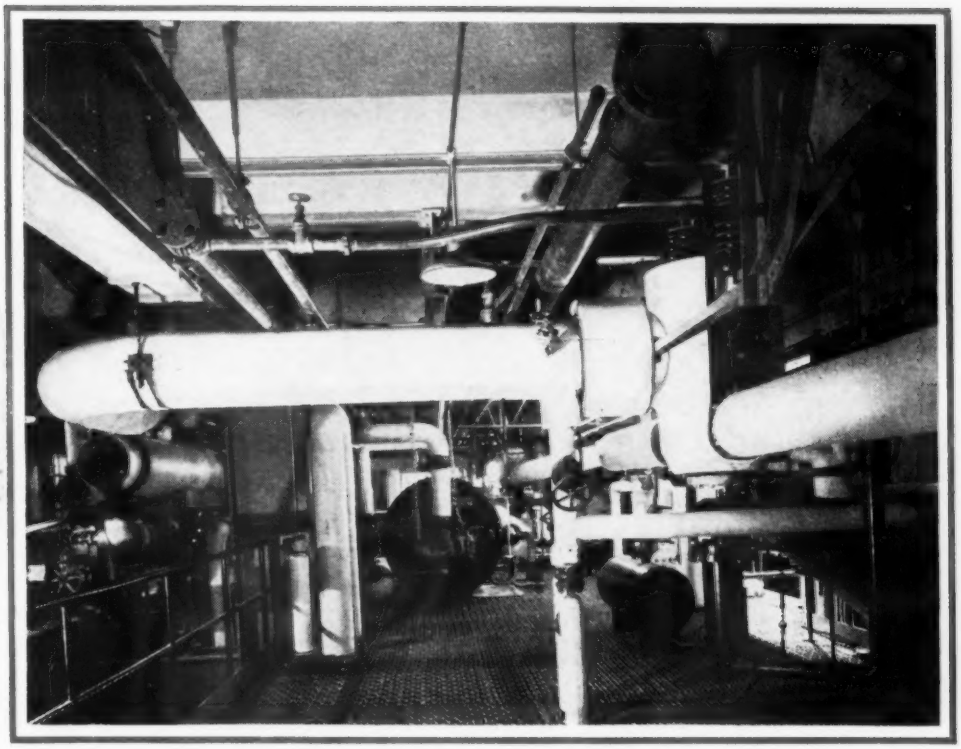
*Editor's note: Further details of recirculation-bypass arrangement and leakoff connections by Mr Karassik will appear in an early issue of* POWER.

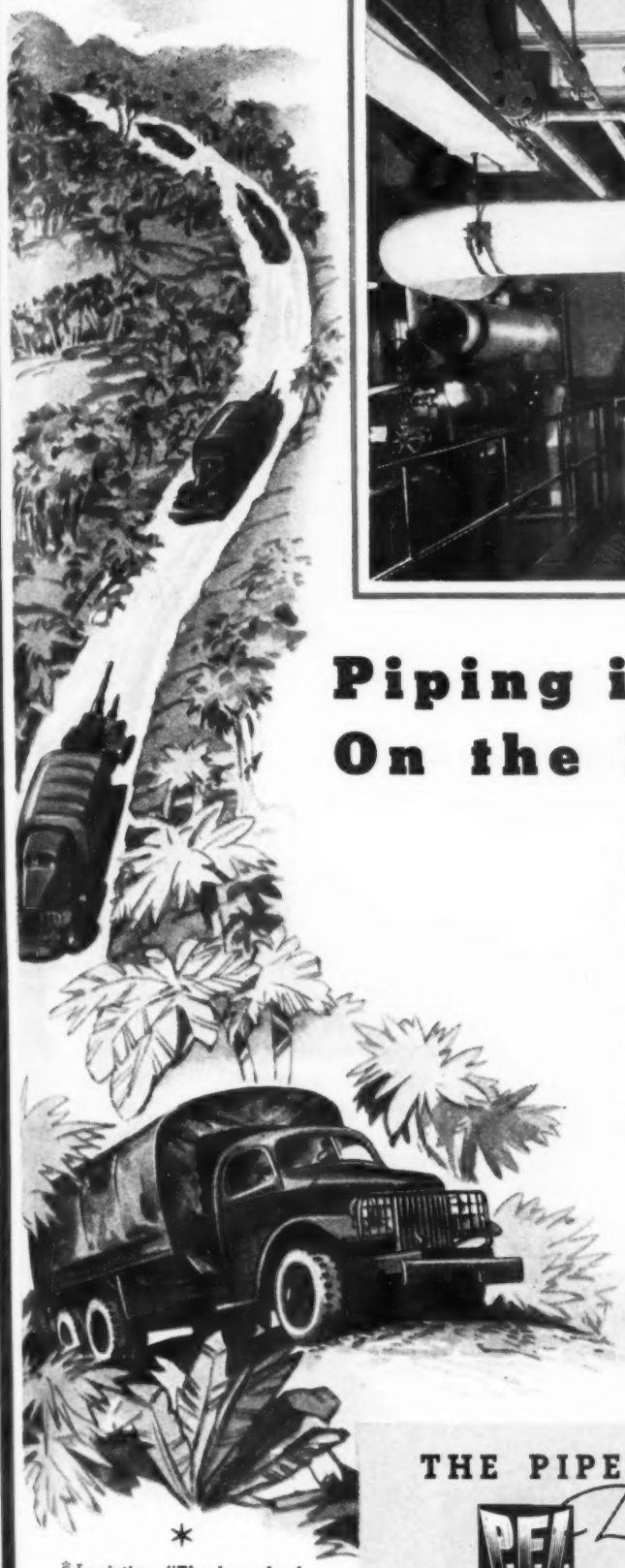
## Readers' Problems

(*Continued from page* 115)

throttle of the prime mover is opened a little more, some in-phase amp is generated and fed to the line, such amp being shown by vector *AF*. Vector *AF* for generated in-phase current points to the right, and vector *AB* for the consumed in-phase current points to the left, while in both cases the vector for the reactive current *BC*, *AD* or *FE* points in the same direction—down. In the case of the generated in-phase current, the total current is represented by the vector *AE* which then lags behind the in-phase current (vector *AF*) by the angle $\phi$, and the pf is lagging.

When a synchronous machine changes from motoring to generating, the direction of the in-phase current reverses, and in the former case the pf is said to be leading, while in the latter it is lagging even though—and this is important—no change whatsoever has been made in the reactive current itself.





# Piping is *"LOGISTICS" On the Industrial Front

Almost everything needed to win the war requires piping at some stages of its manufacture. The finished product or some of its ingredients may move through piping . . . and then the power or heat used in manufacture is probably steam that flows through piping.

Piping is "logistics" on the industrial front. Its task is to transport materials or power quickly and efficiently. Hence, the importance to the war effort of good piping . . . the importance of qualified pipe fabricators and every man who contributes his experience and skill to the making of high quality piping.

Qualified pipe fabricators with their extensive specialized equipment and highly skilled organizations are making a vital contribution to the victory for which we strive. They have saved precious time—avoided bottlenecks and catastrophic delays on vital war jobs. They have provided essential war industries with *quality* piping in the face of all difficulties.

* *Logistics—"The branch of military science that embraces the details of transporting and supplying armies."*

**THE PIPE FABRICATION INSTITUTE**

P.F.I. THE PIPE FABRICATION INSTITUTE

*Devoted to the Technical and Economic Problems in Piping*

**1108 CLARK BUILDING • PITTSBURGH, PA.**

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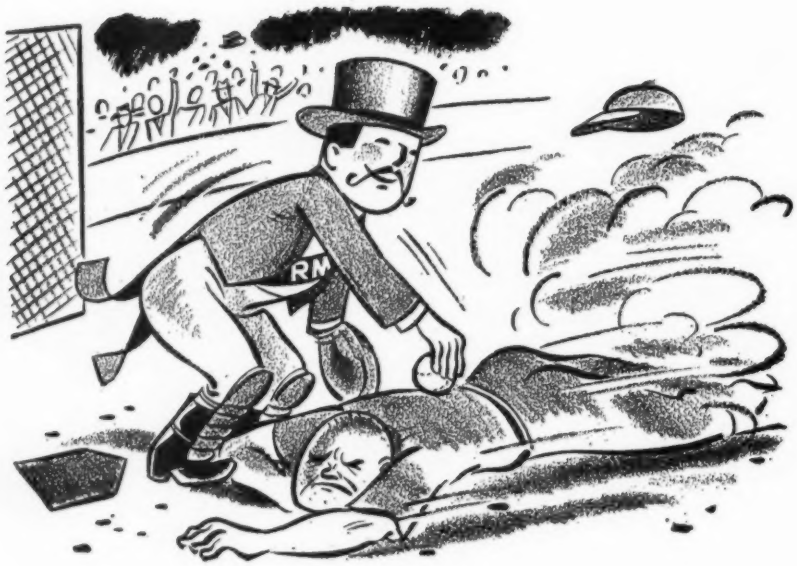
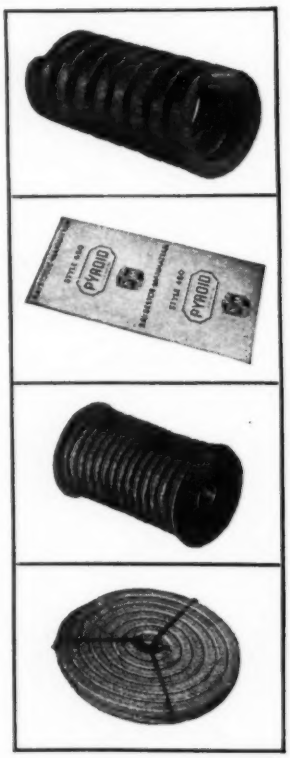



# The "squeeze-play" gets nowhere with R/M PACKINGS

There's nothing a full head of steam likes more than blowing a gasket or a bit of packing into the next county. Under today's increased pressures, it takes a super-duper packing to resist squeezing . . . in steam lines, oil lines, fuel lines, and air lines.




Picking the packing for any job is made easy by the R/M catalog, which is keyed for applications, illustrated, and indexed as to materials and types. Get a copy from your R/M distributor, or write us direct.

Awarded to R/M
North Charleston Plant

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
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*Makers of Packings for Every Industrial Use*

If we have a synchronous machine which may some times operate as a generator and some times as a motor, such a machine should be equipped with a four quadrant pf meter, as shown in Fig. 2, page 115.

In the case of the machine to which MGW refers, while operating as a motor, the instrument would indicate 5½% in the upper right quadrant, as at *A*. If the machine's prime mover were slowly made to pick up a little load the hand would slowly swing clockwise from position *A*. When at *O*, the machine's prime mover would be just carrying the machine's load and losses; there would be no in-phase current and pf would be zero. If the prime mover were to pick up a little more load, the hand would continue to rotate clockwise. When the load reaches an output of 400 kw (just the reverse of the condition given by MGW) the hand would indicate 5½% lagging pf, as at *B*.

*Kalamazoo, Mich.* E E NORMAN.

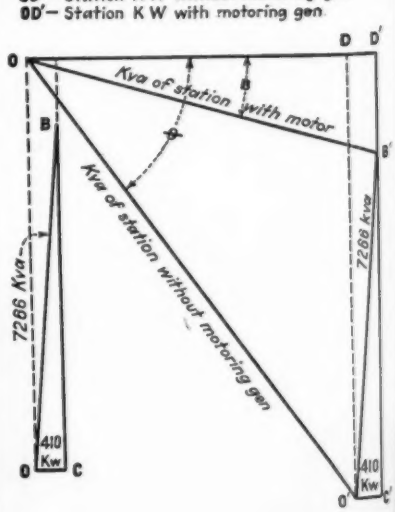
## Install Power-Factor Meter

MGW DOES NOT SUPPLY sufficient information to permit a complete answer to his problem. Addition of all ammeter readings and the use of the total kilowatt hours to find the station pf seems a poor substitute for a pf meter. The 2000 amp of motoring unit must be added vectorially to obtain the station pf by this method.

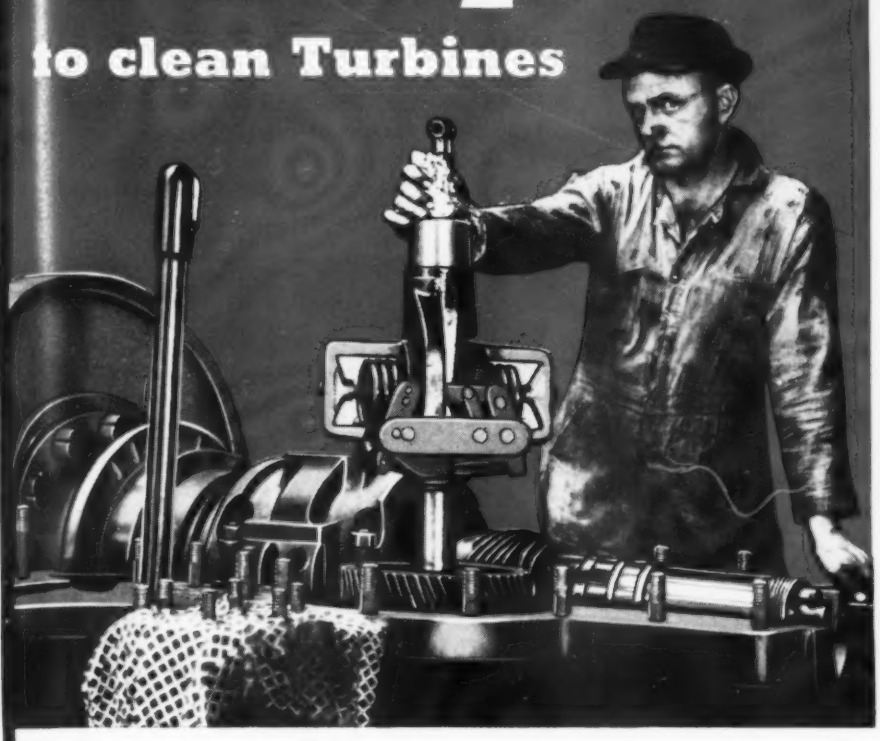
Construction of a vector diagram, as shown in the sketch, is as follows:

Lay off line *OD* to a suitable scale representing assumed station kw. On line *OD* extend *DD'* for 410 kw. consider motor external to station.

Construct line *OB*, on triangle extension, equal to 7266 kva to the same scale and so that angle *BOC* is equal to angle corresponding to .055 leading



# 2 ways to clean Turbines



## 1 This way's always a lot of work

**Safe cleaning practice.** When turbines have operated on oil that has developed excessive sludge and acidity, all trace of contaminants should be removed before refilling. Any contaminants left in the system will speed up deterioration of the new oil. Here are highlights of safe practice:

1 Completely drain the system of old oil.

2 Remove the oil cooler and completely clean it of deposits and old oil.

3 Clean the oil reservoir and precipitation tanks.

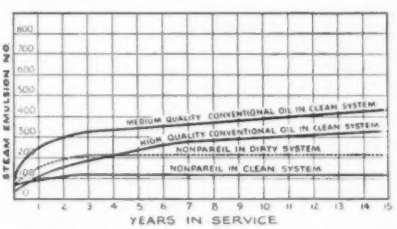
4 Remove bearing caps and end plate, and clean recesses in and around bearings and pedestals.

5 Clean screens and filter or centrifuge.

6 Examine piping layout to determine if it will completely drain. If there are low places or pockets, open up pipe joints at suitable places to insure complete drainage. If possible, pipes should be wiped by drawing rags through them.

7 Clean the governor mechanism, bleeder valve operating mechanism, and oil-operated throttle. It is usually necessary to remove hand plates to insure complete cleaning of the pockets and recesses in the governor mechanism.

All who are familiar with turbine operation know that the foregoing is a bare outline of necessary steps which involve many hours of labor and down time.




**Above chart** shows that the S. E. number of Nonpareil Turbine Oil remains fairly constant in service, while that of conventional turbine oils tends to increase, due to acidity and sludge. The two lower lines show the advantage of thoroughly cleaning a turbine before installing new oil

## 2 This way you do the work only once

Use Nonpareil Turbine Oil, and you need clean your turbine only once—at the time of the original fill.

**Why Nonpareil** keeps turbines clean. Turbines need cleaning if and when they develop excessive deposits in the oil system. Basic cause of such deposits is oxidation—the absorption of oxygen by certain unstable hydrocarbons in the oil. There are two main types of these unstable hydrocarbons—one forms asphaltenes, the other, organic acids.

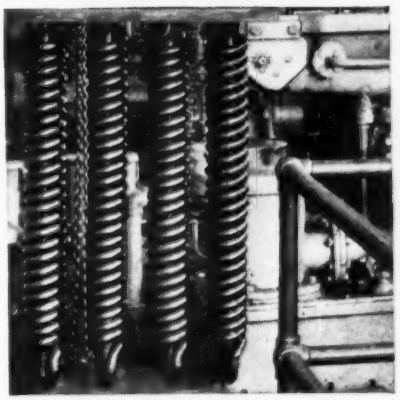
In the refining of Nonpareil, all of the asphaltene-forming hydrocarbons are removed—which completely eliminates this type of deposit. This statement can be made about very few oils.

We know of no refining process that will remove *all* acid-forming hydrocarbons. But we render them permanently harmless in Nonpareil by the addition of a patented inhibitor. This lets us guarantee the neutralization number of Nonpareil never to exceed 0.15 for the life of the turbine. In actual service, it is more likely to be around 0.05, as hundreds of turbines have proved after 5 to 15 years of operation. *This* claim can be made for *no* other oil.

Thus, with the two basic causes of deposits removed, Nonpareil stays clean—retains its new-oil condition. Use it, and you'll never again need to clean your turbines.

A Standard Lubrication Engineer will gladly furnish details, service records, and other proof. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

**OIL IS AMMUNITION . . . USE IT WISELY**



**Unretouched photograph** showing cooler coils from a steam turbine after 10 years of operation on the same batch of Nonpareil Turbine Oil without change. Note cleanliness.

★ ★

**NONPAREIL TURBINE OIL**

★ ☆

# STANDARD OIL COMPANY (INDIANA)

# NEW Stanobar GREASE

## It's a war-bred grease for ball and roller bearings

• ALREADY accepted as a veteran—while still a rookie—Stanobar Grease No. 2 is giving a splendid account of itself on wartime production lines. Today's swift pace demands this new type grease. Longer hours of operation alone call for a more stable grease to resist heat and oxidation, while the need for more frequent lubrication of bearings makes an easily-handled gun grease an asset.

Stanobar brings you both these advantages. It's a smooth

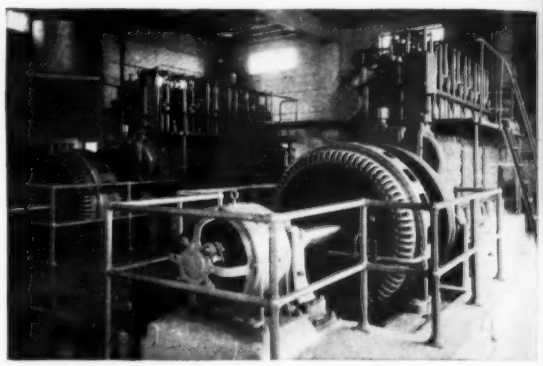
(not fibrous) type grease that flows readily through grease guns. It contains inhibitors which reduce oxidation of both the soaps and oil in Stanobar. That means less cleaning of bearings, and less labor and lubricant required to flush out old grease.

Stanobar resists thinning out when worked—that helps reduce leakage. It may also enable you to replace two or three grades of grease you are now using with this one grade of Stanobar.

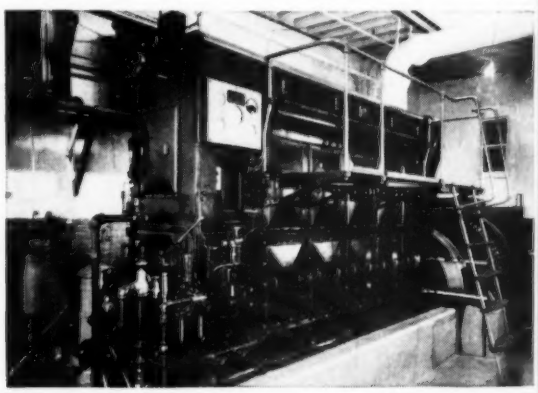
Let a Standard Lubrication Engineer explain some of the other advantages of new Stanobar—and help you make a test.

## How to get more power out of your present Diesels

Power shortage? Make this your answer: Get more work-hours from your present Diesels. Cut down-time for cleaning carbon and sludge. Reduce power loss through stuck rings, worn liners, and carbon deposits, as these operators have done.



**Over 20,000 hours** of trouble-free operation on Nonpareil in a 150 HP Diesel influenced the selection of Nonpareil Diesel Oil for the two 500 HP units, of the type pictured above, in a central state foundry. Now, after 10,000 hours on each of these engines, Nonpareil is repeating the performance—low maintenance, and no ring sticking, cleaning, or forced shut-downs.



**Oil trouble cleared up** with the first test of Nonpareil Diesel Oil is the report from a Michigan industrial plant. The change to Nonpareil was made after the oil that had been put into the new unit, above, thickened within a short time. Nonpareil has operated for three years now, for periods five times as long, without thickening.

As the first step to boost power output, check the oil you are using. A Standard Lubrication Engineer will be glad to help you. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

**NONPAREIL DIESEL OIL**

*OIL IS AMMUNITION . . . USE IT WISELY*

**STANDARD OIL COMPANY (INDIANA)** STANDARD SERVICE

• LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRIC

# FLASH!

# A New Dust Collector Made of Non-Critical Ceramic Fire Clay

As steel is badly needed for war production, the Thermix Ceramic Dust Collector—designed and built by the Prat-Daniel Corporation—is now constructed entirely of materials *not essential* to the war and it can, therefore, be delivered *without a priority*.

This sensational new Thermix CERAMIC Dust Collector has a series of 6" precipitating tubes made of a special tough fire clay which is even harder than the steel tubes used in previous models. These tubes are thick and rugged so that they will not be injured by normal handling or temperature changes. But if accidentally damaged, they can be inexpensively and quickly replaced with standard shapes from our stock.

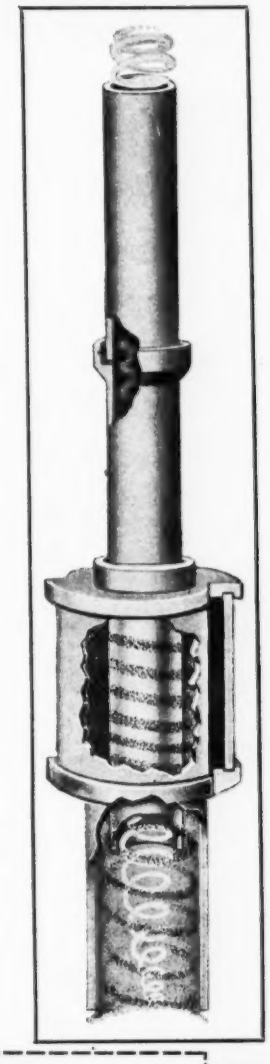
These ceramic tubes weigh no more than steel tubes and they permit installation of the Thermix Ceramic Dust Collector outside the plant without a protecting structure.

Due to its compact design, the Thermix Ceramic Dust Collector fits readily into small space.

Throughout, the design follows closely that used in Prat-Daniel's standard steel Thermix Tubular Dust Collectors now in operation with over 40,000,000 lbs. of steam capacity per hour.

It assures the high efficiency collection of practically all fine dusts, powders and pulverized fuel fly-ash.

***Write for full particulars or mail the coupon.***



## PRAT-DANIEL CORPORATION, Port Chester, N. Y.

***General Sales Agents***

**Thermix Engineering Co., Greenwich, Conn.**

***Representatives in Principal Cities***

# Thermix Ceramic DUST COLLECTOR

**PRAT-DANIEL CORP.**
**88 S. Water St., Port Chester, N. Y.**

Without obligation on our part, you may send details about the Thermix Ceramic Dust Collector.

Name .....

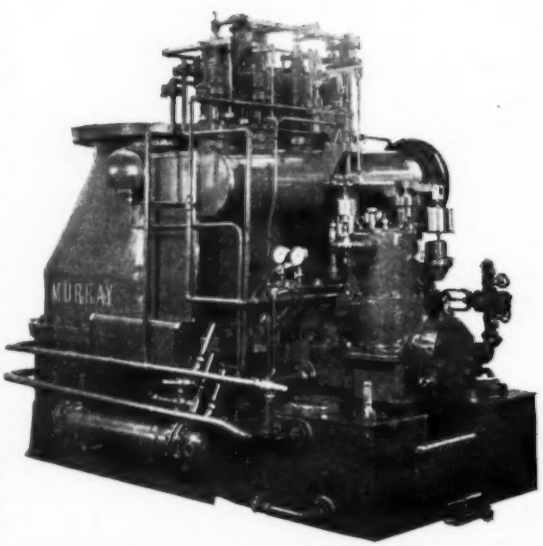
Address .....

City ..... State .....

# MURRAY TURBINES

*for Air Conditioning Compressor Drive*

★ The requirements of steam turbine drive for air conditioning centrifugal compressors are severe, involving unusual operating conditions ordinarily not encountered in other applications. MURRAY Turbines have been developed to meet any of these conditions which include high speeds, critical variable speed governing, necessity for emergency quick shut down in case of abnormalities in the refrigeration system, and frequently, operation from the exhaust of existing reciprocating apparatus.




● View shows one of many MURRAY Turbines designed especially for air conditioning compressor drive. This unit develops 1000 h. p. at 4# initial pressure, 26" vacuum and 4100 r. p. m. It is equipped with variable speed, oil pump, oil relay governor; automatic nozzle control; auxiliary turbine driven starting oil pump; vacuum breaker actuated by overspeed governor; solenoid . . . trip to stop turbine in case of abnormalities in the refrigeration system. Governor includes automatic control which maintains even temperature of the system's cooling medium by varying the capacity of the compressor through the speed. Steam inlet is 12" and exhaust outlet is 36" arranged in an upward direction.

Other MURRAY Turbines are driving air conditioning compressors at 8000 r. p. m. or have extraction or extraction mixed pressure gear to maintain the proper heat balance in the plant.

BOILERS · TURBINES · ENGINES

MURRAY IRON WORKS COMPANY

INCORPORATED 1870

BURLINGTON IOWA


pf. This can be found from tables. Join *C* and *B*. From *O* lay off *OO'* to the same scale so that angle *O'OD* is equal to the angle corresponding to the station power factor without motoring unit. Transfer triangle *BOC* so that *O'C'* is parallel to *OD'*. This triangle is lettered *B'O'C'*.

Join *O* and *B'*. This is station kva with motoring unit. Produce C'B' to *D'*. *OD'* is station kw with motoring unit. *D'B'* is reactive kva or kilovars. Cosine of angle *D'OB'* is station power factor.

*Hamilton, Ont.* J A COULDEN

## Consider Generator Field Current

THE FACT THAT MGW's unit draws a small load from the system indicates that it is operating as a motor, since the kwhr meter is running backwards.

Assuming the kwhr reading to be the one hour's consumption, the indicated average pf would be 5.5%.

This value represents only the pf of the spare unit that furnishes leading reactive kva, while the other units in operation carry the actual kw load. The pf is leading if the value of the generator field, as indicated by the field ammeter, is above the minimum point for a generator.

Since the 400 kwhr is input to the unit furnished by the other generators, they should not be included in the station total since this motoring unit consumes energy the same as any other motor load.

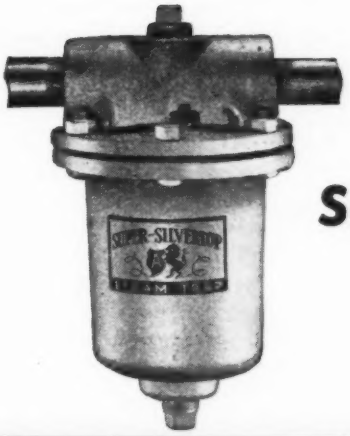
When two or more units are operating to deliver energy, it is not correct to add directly the ampere readings of the different generating units unless pf of all units is the same. If it is not the same, the characteristic of the load of each unit must be calculated separately to show the reactive kva for each unit. Then by adding the kw loads together and the reactive kva loads together we get the total as furnished by all the generators operating. From this, rkva ÷ kw gives the tangent of the average phase angle of the system and from a trigonometric table the corresponding cosine value (power factor) can be obtained or calculated from the formula:

$$\text{pf (\%) equals } 100 \times \sqrt{\frac{1}{1+\tan^2}} \text{ or}$$

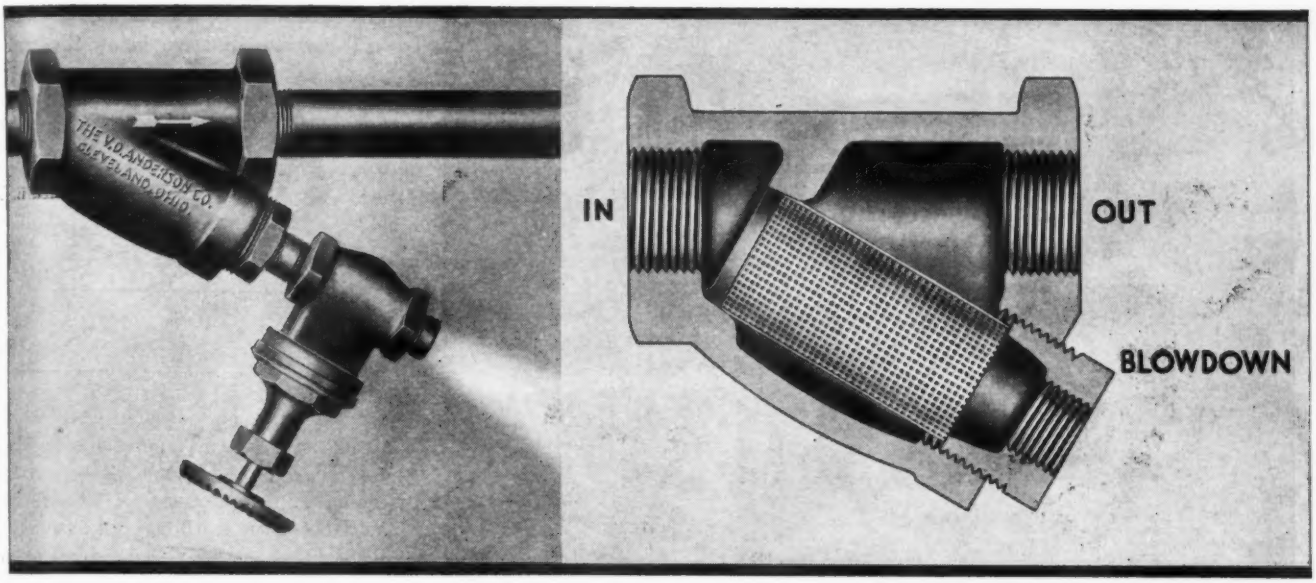
$$100 \times \sqrt{\frac{1}{1+\left(\frac{\text{rkva}^2}{\text{kw}}\right)}}$$

*Brooklyn, N. Y.*

C O VON DANNENBERG




## *The manufacturer of Super-Silvertop Steam Traps also makes—*

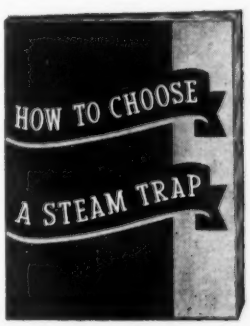



# ANDERSON *self-cleaning* STRAINERS

● Widely used, but probably not so well known as Anderson Super-Silvertop Steam Traps, are *Anderson Strainers.* These improved strainers with their stainless steel elements remove scale, grit and sediment from the steam line, thus protecting your expensive equipment from destructive wear.

The Anderson Strainer cleans itself when a blowdown valve is used or when the pipe plug is removed. It's easy to install and inexpensive so that one can be used on every piece of equipment—that includes pressure regulating valves and metering devices, liquid and gas lines, steam traps and air tools, spray heads and oil burners, solvent stills and temperature regulating valves.

Write today for a copy of "How To Choose A Steam Trap" which gives complete specifications on these Strainers.

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## THE V. D. ANDERSON COMPANY

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## *As Well as New* — Provide
# DISTINGUISHED SERVICE

## . . . Put your *Used Darts* back into Action

Distinguished service . . . economical, *tight-joint* performance . . . that's what you can count on from a Dart Union—even though it has been used over and over again. And that is why Darts should *not* be discarded . . . but put back to work.

The explanation of a Dart's extra-values is as simple as this. Dart's have extra-wide matched bronze seats, ground to "true-ball" surfaces for correct leak-proof seating and which prevent corrosion at the joint . . . clean-cut threads that prevent scoring . . . extra-heavy nuts and bodies made from High-test air-refined malleable iron that resists pipe strains and rough handling.

Get all the service that Dart Unions offer you . . . put your used Darts back into action. And see your supplier for new ones.

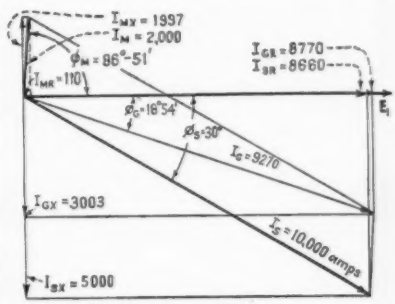
DART UNIONS

E. M. DART MFG. CO., PROVIDENCE, R. I.


## Reduces Reactive On Other Generators

The pf of the motoring unit in MGW's problem is $\frac{400{,}000}{2100 \times 2000 \times 1.73} = .05498$ corresponding to a phase angle of 86° 51′. Operating one generator as a motor does not affect the outside-system pf since it is governed by the electrical characteristics of the transmission line and connected power load. The distribution of reactive kva between the units at the station can be altered by this method, and the total reactive kva on the operating units reduced with an increase of 400 kw in the in-phase power.

The vector diagram below illustrates




the problem. For simplicity, only one phase is shown. $E_1$ represents the bus voltage. $I_s$ is the system phase current assumed, for purposes of illustration, at 10,000 amp at a lagging phase angle $\phi_s$ of 30°. $I_m$ is the phase current of the motoring unit at a leading angle of 86° 51′. The leading reactive current $I_{mx}$ of 1997 amp and lagging reactive current $I_{sx}$ of 5000 amp give a resulting lagging reactive current of 3003 amp, $I_{gx}$, to be supplied by the generators. The in-phase current supplied by the generators $I_{gr}$ is increased from 8660 $I_r$ to 8770 by the motoring unit. Thus the total current per phase supplied by all generators $I_g$ becomes 9270 amp at a phase angle of 18° 54′ lagging, instead of the assumed value of 10,000 amp.

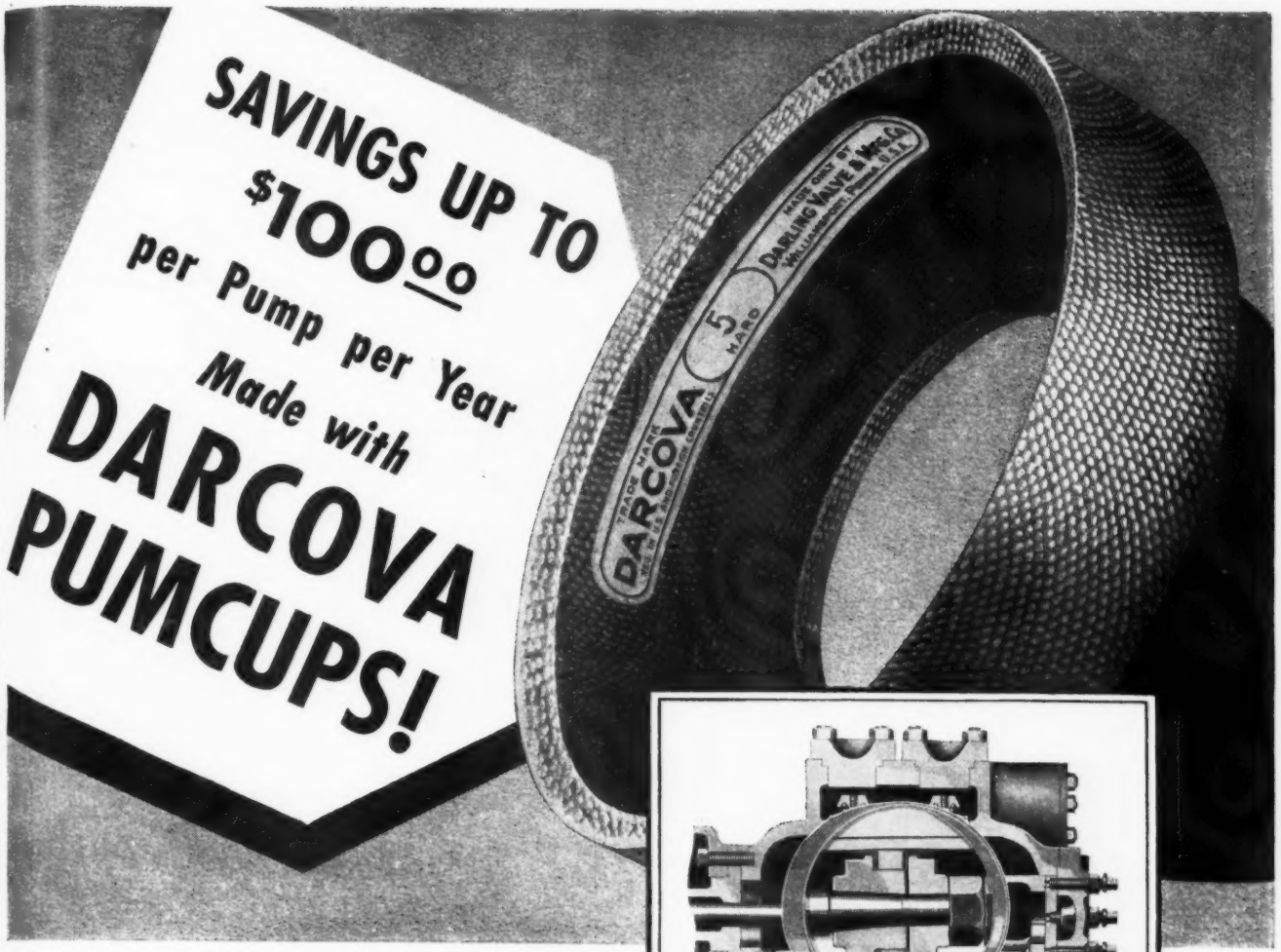
*Saint John, N. B.* C G CLARK

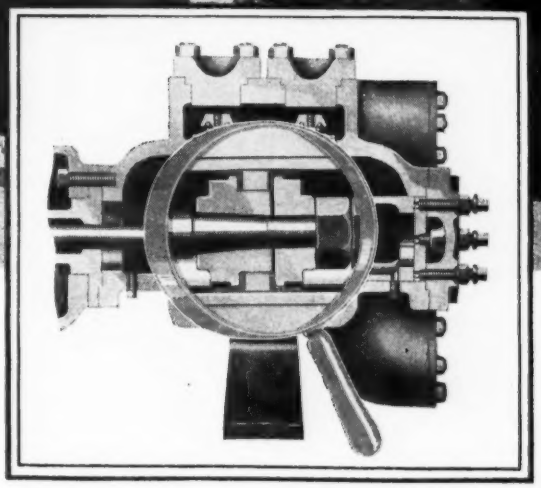
## Install Reactive Meters

POWER FACTOR of MGW's generator is 5.5%, obtained as follows:

$$\text{Kva} = \frac{1.73 \times 2100 \times 2000}{1000} = 7270;$$

hence, power factor is 400/7270 = 0.055. It must be assumed that the 2000 amp is leading, but this would depend on the field excitation. The machine should be operated with sufficient excitation to furnish the lowest leading pf without exceeding the safe ampere or kva rating. It is conceivable that the machine might be operating consider-



● Don't wait — start now to cut your reciprocating pump costs by installing Darcova Pumcups. Your pumps, new or old, regardless of present packing will operate with more efficiency, once this money-saving installation is made.

Time tested over a period of *35* years in the most severe pumping operations, this truly remarkable composition product has successfully performed under the hardest and most grueling services. Darcova Pumcups offer advantages — *many* advantages that no other type of packing can give. Try Darcova Pumcups — keep track of the costs and judge for yourself.

**TAKE ADVANTAGE OF THE FREE *DARCOVA* SURVEY SERVICE**

**Darcova field men can help you just as they are helping others, to get the most for your pumping dollar. Call them — or ask any Supply Store — or write direct.**

DARCOVA
TRADE MARK
THE ORIGINAL COMPOSITION CUP

**DARLING VALVE & MANUFACTURING CO.**
WILLIAMSPORT, PA.

A 2½" layer of B-H No. 1 Cement which can be economically applied, minimizes heat-loss on this feed-water heater.

You'll be interested to tick off these reasons for trying B-H No. 1 Cement, to see whether you've been using something less desirable:

**1.** Mixes with cold water to form a plastic mass which can be readily troweled to the surface of the equipment to be insulated.

**2.** Trowels smoothly and sticks easily to brick or metal.

**3.** A special rust inhibitor prevents corrosion between the metal surface and the insulating cement, thus insuring a permanent bond of the insulation and no pitting of the metal surface.

**4.** Effective for temperatures up to 1800° F. If not used above 1200°, it can be broken up, remixed, and used again.

**5.** Practically no shrinkage, so that it does not crack or pull, and 100 lb. covers approximately 60 sq. ft., 1 inch thick.

**6.** Its base is B-H Black Rock-Wool which is fine, resilient, high-fusing, light-weight, and extremely permanent.

Try B-H No. 1 Cement on a tough little job like this. Check its ease of application, adherence, rust prevention, and high insulating efficiency.

Write today for a free 5-lb. sample. You'll enjoy playing with it on a patch job—and we'll prove our case.

BALDWIN-HILL *Insulations*

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NEW YORK CHICAGO KALAMAZOO


ably underexcited with a lagging pf.

*Westbury, L. I.* A W Fox

## Improves Other Plant's Power Factor

IN MGW's PROBLEM, the generator is running as a synchronous motor with an overexcited field and driving its prime mover. If there are 2000 amp per phase and the phase-to-phase voltage is 2100 then:

$$pf = \frac{400}{2100 \times 2000 \times 1.732} = \frac{400}{7274} = .055$$ or 5.5% lead

Add the 2000 amp vectorially to determine plant fp. MGW seems to think that this motoring generator improves the plant pf. On the contrary, if he will make a study of the problem, he will find that the other plants on the system are running with improved pf at the expense of his plant. If it were not for this motoring unit, the reactive load would have to be divided between all the plants.

*La Crosse, Wis.* MANLEY BENRUD

## Thanks, Anyway

The Editors wish to acknowledge additional answers received from P Donohue, New York, N. Y., and Carl Bachmann, Schenectady, N. Y.

## Hog Fuel Combustion

(*Continued from page* 101)

1940), the calculation yields the results shown in the table at the bottom of page 101.

Calorific value of redwood hog fuel has been reported as 9120 Btu per lb AWS; determined in a bomb calorimeter. When hog fuel is burned under a boiler, heat available varies according to moisture content and amount of excess air. Heat losses, exclusive of those arising from radiation and incomplete combustion, and of those resulting from moisture content and excess air, are developed as follows, per lb AWS:

1. Assume 5% heat loss in combustibles in ash, etc. 456 Btu
2. Heat to raise fuel temp from 50 to 212 F= $0.33 \times 162$ ..... 54 Btu
3. Heat to raise air temp from 50 to 212 F= $0.24 \times 162 \times 6.46$ ..... 251 Btu

*A thought addressed to those who need small diameter valves for precise, severe throttling services that are handled best by Bar Stock Valves.*

In 1940, Lend-Lease made its call for Bar Stock Valves. But, there was still ample capacity for American industry.

Then came war—cargo and warships, high octane gasoline, raw materials for synthetic rubber, munitions, aircraft—all under wartime drive, demanding Bar Stock Valves because they provide the best means for precise, severe throttling.

That is the answer to the question: "Why don't we get Bar Stock Valves?"

We of Reading-Pratt & Cady are giving to this war production all we've got, turning out these finely made valves in volume by methods that will be of value to you when the war end makes it possible to resume the kind of business we prefer—making valves for a peaceful America.

**READING-PRATT & CADY BAR STOCK VALVES**
**Sizes up to 1"**

Globe, Cross, Angle, Plug-Type . . . Precise, automatic production . . . Long seating contact. Fine spindle threads. For severe throttling services. Steam, water and other fluids. Ratings: from 4000# at 150° F. to 475# at 1000° F.

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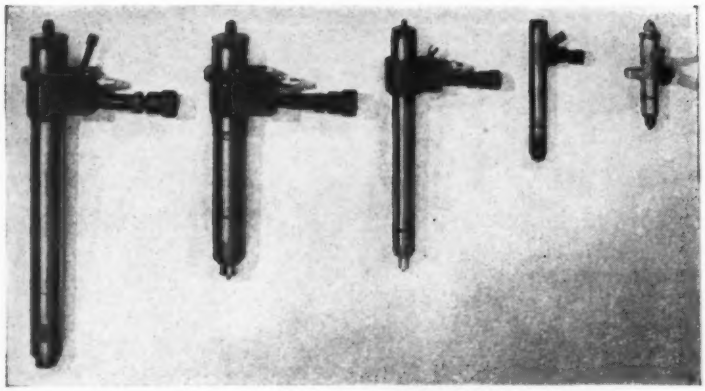

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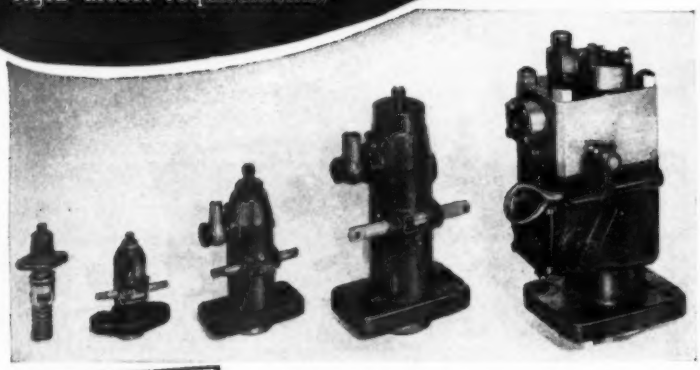
Adeco "know-how" is your assurance of the finest in diesel fuel injection equipment. Today's Adeco pumps, nozzles and nozzle holders reflect the long experience of this pioneering organization in developing precision equipment for the most rigid diesel requirements.



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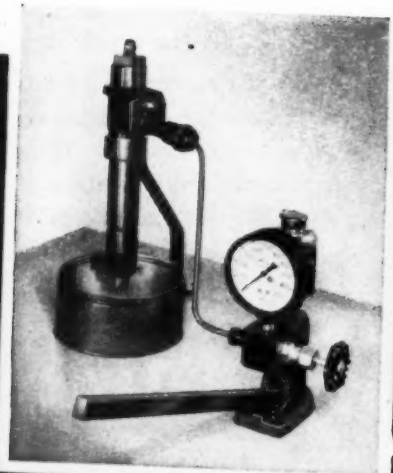

AIRCRAFT & DIESEL EQUIPMENT CORPORATION

4401 NORTH RAVENSWOOD AVENUE • CHICAGO, ILLINOIS

4. Heat to vaporize water of combustion=0.531×970. 515 Btu
5. Heat above 212 F in flue gas at 600 F=0.25×388 ×7.458 ..... 723 Btu

Total initial heat losses..1999 Btu

Maximum net heat available from the combustion of redwood AWS, with no excess air and with flue gas at 600 F, would then be 9120—1999=7121 Btu per lb AWS.

### *Fuel Loss*

For each 5% of moisture in the fuel, loss would be:

1. Heat to raise water from 50 to 212 F=0.05×162 8.1 Btu
2. Heat of vaporization= 0.05×970 ..... 48.5 Btu
3. Superheat; 212 to 600 F =0.475×388×0.05 ... 9.2 Btu

Total per lb, AWS.... 65.8 Btu

For each 10% excess air, loss would be, per lb AWS:

$0.24 \times 0.10 \times 6.46 \times 548 = 85$ Btu

The chart, page 101, resulting from a series of calculations for various percentages of moisture and excess air, shows effect of these losses graphically. Included on the chart is a steam-rate curve applying to the following boiler conditions: 225 psi gage, steam pressure; 202 F. feedwater temperature. Heat content of steam at 225 psi is 1200.6 Btu; of 202-F feedwater is 170. The difference is 1030.6 or, we can say, it takes 1031 Btu to produce one lb of steam. This is the basis for the steam-rate curve on the chart.

### *Use of Chart*

To illustrate use of the chart, consider hog fuel of 115% moisture content (AWS) burning with 40% excess air. Enter the graph at 115 on the bottom scale and follow vertically to the diagonal line corresponding to 40% excess air, then read net heat available on vertical scale to the left. This proves to be 5270 Btu per lb AWS. Proceed horizontally to the steam-rate curve, then upward to the upper scale, reading the steam rate as 5.1 lb of steam per lb AWS.

Actual steam rate, under conditions virtually the same as in the example, was found by test to be 4.3 lb of steam per lb AWS. Entering the graph at the top, at 4.3, and following downward and to the left, net heat input appears as 4440 Btu per lb AWS. Losses not included in the foregoing calculations can then be found by subtraction:

# MORE SERVICE TIPS — *for Mason Regulators*

MASONEILAN

**Number 3**

## *Don't Injure the Body Wall*

When disassembling for any reason always place in a vise as shown using a soft metal, such as lead, cover on the jaws. Holding the body in the vise in any other manner may damage it enough to prevent operation of the regulator pilot or main valve.

**Number 4**

## *Don't Injure the Dashpot*

If necessary to place the dashpot in the vise always hold it by the wrench flats as shown. Holding it any other way may so damage it that the piston will not move smoothly. Never use a pipe wrench *anywhere* on the regulator.

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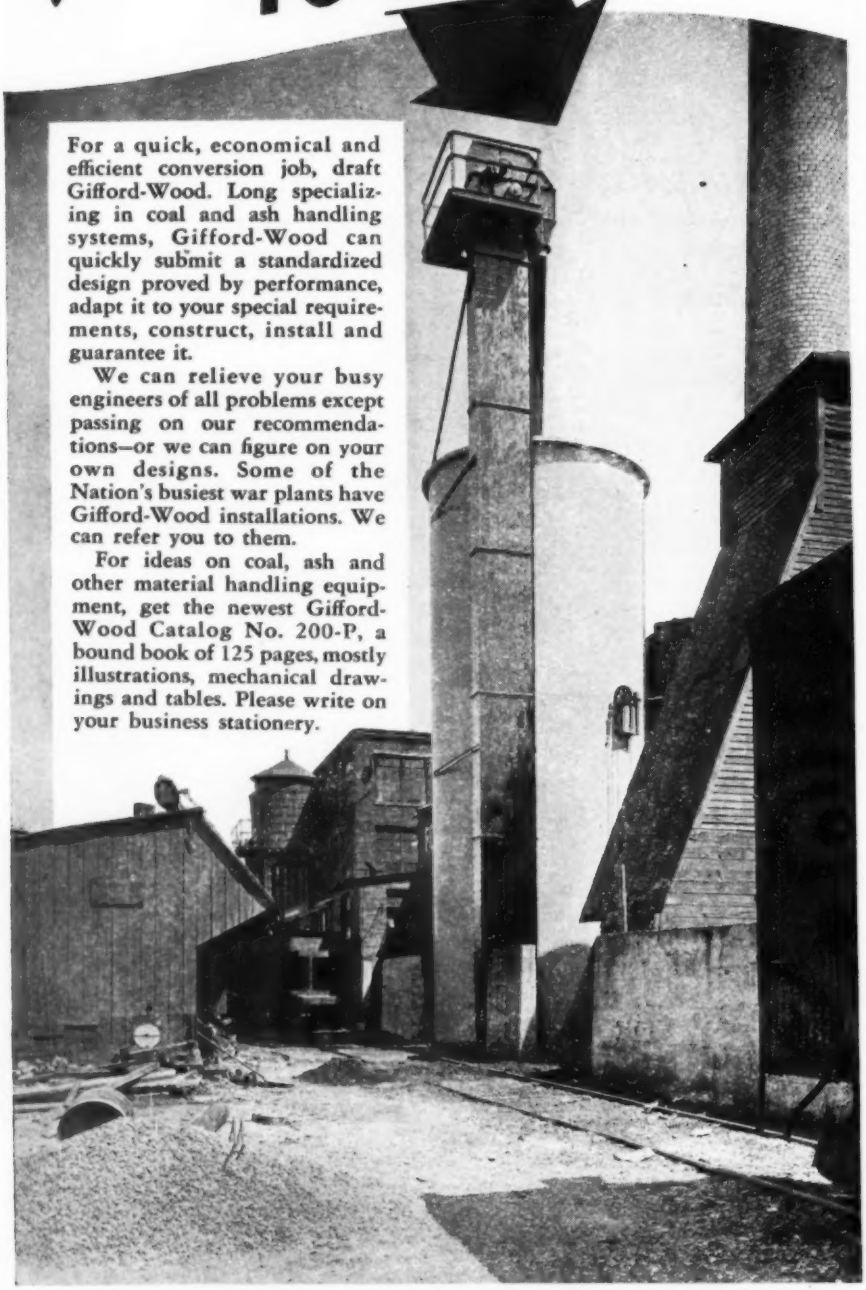

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3885


Net heat available=5270 Btu/lb AWS
Actual heat to steam=4440 Btu/lb AWS

Loss .....830 Btu/lb AWS

Referred to calorific value of the fuel, loss appears as 830÷9120=0.091, or 9.1%. This indicates the presence of what might be termed "avoidable losses" and gives the plant engineer something to shoot at. The boiler tested had little control equipment and the losses appear to be caused in the main, by alternate incomplete combustion and high excess air resulting from feeding fuel intermittently.

## Argument Corner

(*Continued from page* 126)

means of checking their effectiveness. Have you any definite conclusions as to their value?"

From the question it is readily understood that we want to dissolve sludge that settles to the bottom of a tank. It is also stated in the question that several solvents have been tried, but that there is no way of checking their effectiveness. The easiest way would be to look into the tank after a solvent had been given a fair trial. If the sludge were still there, it would follow that the solvent was not good, or vice versa. If there were but one tank for oil storage, it could still be ascertained whether the sludge was not dissolved because oil lines, strainers, heaters and burner tips had become clogged: the fire would sputter and be very irregular. If, on the other hand, the solvent were dissolving the sludge, then the pipes, strainers and heaters would become clean and the flame would burn steadily and evenly from the tip.

The answer, as given by POWER is as follows: "Without complete data, it is difficult to make recommendations because compounds and conditions both vary so much. Be sure first that you're not buying one of the fabled nostrums that give colossal improvements in combustion and produce anything from 50% more steam to an altered election result. Probably the most sensible method is to take some of the mixed oil and sludge and try the settling compounds on a sample. See how much of a given compound is required to settle a given sample, which gives a direct method of figuring its cost."

Let us analyze this answer: In the first sentence it is stated that no recommendations can be made until compounds and conditions are analyzed. No one will argue against this advice, but

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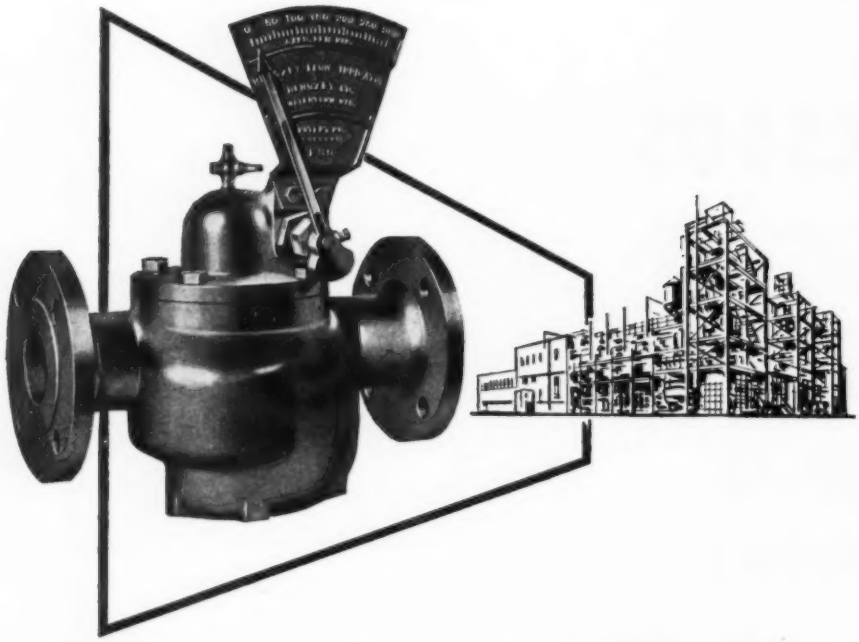

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in the second sentence a lot of talk about "fabled nostrums" and "colossal improvements" could very well have been eliminated. There are good solvents and poor solvents just as there are good valves and cheap valves, good pumps and cheap pumps, etc. Solvents are comparatively new and it has been and will be a hard job to convince the average chief engineer of their merits. The fact that there are high-pressure salesmen, selling inferior products that they say will produce anything up to an "altered election result" does not help the situation.

It is a fact that power plants of large companies are using solvents more and more as time goes on. Not only power plants burning oil but distributors of oil to the power plants are using solvents whenever possible rather than send trucks to pump out sludge.

The third sentence reads: "Probably the most sensible method is to take some of the mixed oil and sludge and try the settling compounds on a sample." The title of the question is "Dissolving Sludge." The word "solvent" means any liquid or agent that dissolves another substance, and yet "settling" compounds are mentioned in the third sentence. What good would it do to use settling compounds with oil when we know it to be a fact that sludge will settle out of oil by itself? What we want is a solvent to *dissolve* the sludge so that it will flow with the oil to the furnace and burn. It naturally follows that, if a solvent can be used to rid a tank of accumulated sludge, a reduced amount of solvent used regularly will keep a tank clean of sludge always.

The last sentence reads: "See how much of a given compound is required to settle a given sample, which gives a direct method of figuring its cost." This means nothing because the sludge we want to dissolve has already settled.

It is not the purpose of this article to criticize POWER, for the writer has not seen a better magazine. The purpose is to get engineers to think more about solvents and to point out without mentioning any particular products or any of the companies that use them, that there are good solvents on the market that are used by some of the largest manufacturers. All one has to do is to look around.

*East Orange, N. J.* F J BALL

## Reciprocating Pump Stroke-Length Adjustment

THE SPECIAL RECIPROCATING PUMP section in February POWER has one paragraph "Piston Strikes Cylinder Head",

# There's No Scarcity of this Armor Plate for Boiler Metal

The metal in your boilers is worth its weight in gold, and when worn out, is practically irreplaceable. Yet power demands are increasing every day.

Here's the story of an essential maintenance, repair and operating material that will keep your boilers in service for years to come. It's available. It's economical. It's recommended by boiler insurance companies and endorsed by thousands of industrial power plants, utilities, railroads and marine operators. Even boilers about to be condemned have sometimes been cleaned, found in better condition than suspected, and given extra years of life with APEXIOR protection.

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*Ask for Publication I-106*

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page 95, with which I cannot agree. This paragraph states in part: "To adjust the cushion valve run the pump without water load, open the cushion valve until the piston strikes the head. If the piston strikes too hard, etc."

My contention is that no one should operate a duplex reciprocating pump with the water end unloaded and that no one should be encouraged to experiment with the cushion valves until the piston strikes the head. The general subject "Reciprocating Pumps" takes in a lot of territory, and unless consideration is given to the size, service, speed, method of control, etc., when giving advice to those who may jump at conclusions, serious trouble and damage may result. From the article as stated, I could conclude that as long as the piston just gave the cylinder heads little love taps there was no trouble in the offing. However, we all should know that would not likely be the case. Anyway, little would be gained by trying to adjust the cushion valves with no load on the pump, because when the pump was put back in service the job might have to be done over.

I can see that in the case of a pump running at practically constant speed, some economy may result by operating at the longest possible stroke as this would reduce the over-all wear and tear of valves, etc. These pumps have suitable external working parts so that striking points can be clearly indicated on the frame, and from them the operator may regulate the stroke accordingly. However, there are many instances where large standard duplex pumps are used to supply process loads, with chronometer-valve throttling controlled from the position of a dead weight accumulator. Speeds range from stalling to perhaps 60 strokes per minute. In such cases it may be to advantage, at least from a safety standpoint, to close the cushion valves and throw away the wrench. Still another complication arises depending upon whether the pump exhausts to asmosphere or into another system in which the pressure may vary considerably.

For a typical example, consider a 24 x 5 x 18-in. standard duplex pump operating on 150-psi steam and supplying a 2000-psi hydraulic system, speed varying from zero to 60 strokes per minute. Plungers are packed with compression metallic packing, glands pulled to the stud breaking point before the customary slackoff. The moving parts weigh nearly a ton for each side. There is no evidence of excessive load while in operation, yet when shut down for a little while it takes practically boiler pressure to move it. Throttle is a

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regular 4-in. globe valve, control with which is not likely to be very precise. I wonder if any of your readers would like to operate this pump with the water end unloaded and fool around with the cushion valves until the piston strikes the head? Most certainly, I would not, and would not permit anyone else. I would prefer to follow the precautionary instructions of the manufacturer, even though some of them are rather specific in an evasive sort of way. I have yet to see an instruction come along with a pump that did not state in effect: "Be sure there is ample supply available and the suction completely filled before attempting to operate, lest considerable damage result."

*Dayton, O.* PHILLIP H WALKER

## Engineering Without Benefit of Capital

CAST-IRON FACTS about the Belgian Congo power plant in the January issue don't make the good doctor's job a remarkable incident in engineering. Missionaries have a faculty for getting what other guys can't get, and the fact that he was a graduate engineer should have been kept up somebody's sleeve.

Now down at Guatemala, I used to frequent a "juicy" little hydro-electric plant. You had to go across the bay from Puerto Barrios by boat to the ice-house pier. From this dump pier you meandered up through scraggly jungle by a babbling brook into a clearing. There stood the shanty that stood for everything Barrios had in the way of ice-cream cones. Above your head was a flume made of wood, naturally, and cascading down from it came fairy fountains.

Naturally the flume was a patched-up affair, held up by "two by fours" and other things, even braces from adjoining palm and "twenty-four hour" trees. Water cascaded down to one of the most wonderful engineering objects in all the Americas. Yes, sir, it was a waterwheel worthy of the pen of Rudy Kipling. His M'Andrew would have praised the man who built it and cussed anew the money bags back home.

The wheel was made of odds and ends. Rims were tied with tiller rope to hub caps by "Spanish windlasses." From the hub great spidery spokes reached out. Many of them were tied together with hooks, lines and sinkers.

Ah, it's a long story, but the fact remains that the engineering job is one of many wonderful ones done in the tropics without benefit of capital.

*Grand Rapids, Mich,*
JOHN M GORRIE

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### BOILERS AND ACCESSORIES

**1** OIL BURNERS — National Airoil Burner Co, Inc, 1284 East Sedgley Ave, Philadelphia, Pa. 12-page booklet No 65 describes low air-pressure oil burner, Type LAT—Model SC, and Airovent Centrifugal Blowers for firing furnaces, ovens, dryers, and air heaters. Tables of burner sizes and capacities, dimensions and weights, heat content of fuel oil, and other useful data are furnished. Photographs illustrate typical applications.

**2** STOKERS—American Coal Burner Co, 18 East Erie St, Chicago, Ill. 12-page Bulletin No. 78 covers the Fyr Feeder multiple spreader stoker. Booklet describes exclusive features of stoker, including multiple feeding unit, non-clogging coal agitator, accurate overfire air control, etc. Also pictures several typical Fyr Feeder installations.

**3** INSULATING BRICK — Universal Zonolite Insulation Co, 135 South La Salle St, Chicago, Ill. 4-page booklet describes Zonolite insulating brick designed primarily as back-up insulation for refractory brick in service range up to 2000 F. Product is said to reduce operating costs and increase furnace efficiency. Booklet also contains charts, photographs and tables.

**4** DUST COLLECTOR — Thermix Engineering Co, First National Bank Bldg, Greenwich, Conn. 4-page bulletin describes Thermix dust collector made of non-priority material. Describes construction of new collector, made with ceramics, presents advantages of the dust collector, as well as a brief description of Heacon damper.

### ELECTRICAL EQUIPMENT

**5** DISTRIBUTION DUCT — Bulldog Electric Products Co, 7610 Jos Campau Ave, Detroit, Mich. 76-page bulletin is a handbook on the inclosed busbar method of electrical distribution for industrial plants and commercial buildings. Contains general descriptions and illustrations of basic design, methods of estimating and layout, symbols for layout men and estimators, suggested hanger arrangements, technical information and construction details, application data, typical specifications, etc.

**6** ELECTRICAL DISTRIBUTION — Allis-Chalmers Mfg Co, Milwaukee, Wis. Bulletin B-6186 describes power and distribution transformers and other elec-



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trical distribution equipment important in maintaining an efficient flow of power to war industries. New book discusses wartime considerations, such as use of construction and standardization of design, thus saving vital materials in manufacturing and providing advantages of interchangability in installation.

**7** BATTERY CHARGERS — General Electric Co, Schenectady, N. Y. 8-page bulletin (GEA-3923) describes in detail the battery-charging equipment, including single battery control, multiple circuit battery control, and motor generator sets. Also describes charge control units for automatically disconnecting chargers and batteries when they have received correct amount of charge.

**8** ELECTRONICS — Allied Radio Corp, 833 West Jackson Blvd, Chicago, Ill. 98-page catalog includes detailed listings of transformers, resistors, condensers, rheostats, relays, switches, rectifiers, electronic tubes, tools, wire and cable, sockets, generators, power supplies, converters and all other types of equipment in radio and electronics fields.

**9** ELECTRONICS INDEX — Electron Equipment Corp, Palm Springs, Calif. Bulletin No. 170, entitled "Electronics Index of Industrial Equipment," shows what new electronic equipment is available for the industrial plant, how it is used, and points out advantages, along with equipment illustrations. Describes rectifiers, cycle changers, motor control, phase converters, furnace voltage controls, etc.

**10** VOLTAGE REGULATORS — Allis-Chalmers Mfg. Co, Milwaukee, Wis. Catalog No. B-6056, 24 pages, contains installation photographs, operational drawings and standard rating charts and also a section describing theory of step-type regulator operation.

### HEATING, AIR CONDITIONING AND REFRIGERATION

**11** UNIT HEATERS—Modine Mfg Co, 1820 Racine St, Racine, Wis. Unit Heater Maintenance Chart offers rules to insure satisfactory operation of unit heaters and to prevent their damage and deterioration. Chart lists vital points; motor, condenser and casing and discusses maintenance of each.

**12** COMPRESSORS — Allis-Chalmers Mfg Co, Milwaukee, Wis. Bulletin B-6211 discusses Ro-Flo compressors and pumps of sliding vane type with illustrations. It is stated that motors may be directly connected and operate at high speeds, from 1200 to 1800 rpm, effecting an additional wartime service. Engineering description is supplemented by installation diagrams, curves showing relationship between pressure, temperature, and volume, photographs and section views.

**13** VENTILATORS — American Steel Band Co, Pittsburgh, Pa. 12-page bulletin covers Asbo design of roof ventilators that afford maximum exhaust, freedom from downdraft, and complete weather protection. Method of estimating number and size of ventilators required presented, as well as capacities of gravity type units.

**14** VENTILATORS — Swartwout Co, 18511 Euclid Ave, Cleveland, Ohio. 8-page Bulletin 217 describes Swartwout NCM (non-critical materials) roof ventilators, in two types of materials used for different styles of ventilators serving two different purposes. In new ventilators less than 5% steel is used per square foot of material surface. Also lists installation methods and standard applications of company's ventilators and heat valves.

### MECHANICAL TRANSMISSIONS

**All literature designated with a star (★) may be obtained only by writing directly to the manufacturer on company letterhead, giving writer's name and title.**

★ POWER TRANSMISSION — Link-Belt Co, 307 N Michigan Ave, Chicago, Ill. 180-page illustrated General Catalog No. 850 lists representative types and sizes of power transmission and materials handling equipment, giving preference throughout to more widely adaptable designs. Dimensions, weights, list prices, and other data are given on chains, sprockets, drives, bearings, castings, couplings, clutches, pulleys, conveyor idlers, screw conveyors and speed reducers.

**15** V-BELTS—Manheim Mfg & Belting Co, Manheim, Pa. Catalog describes Veelos adjustable V-belting, link V-belting sold in rolls. Book shows in detail sequence of operations to take belt apart with ordinary screwdriver, then shows necessary steps to couple belts together without use of any tools whatever.

**16** GEAR UNITS—De Laval Steam Turbine Co, Trenton, N. J. Leaflet E-1219, 4 pages, describes worm gear units for either top or bottom drive in ratios 3⅝ to 1 up to 60 to 1, intended particularly for low-power machinery operation, such as small mixers, dryers, automatic furnaces and ovens, churns, conveyors and elevators, mechanical stokers, etc.

**17** GEARS—Philadelphia Gear Works, Erie Ave & C St, Philadelphia, Pa. Combination catalog and gear data book, 72 pages, includes dimension tables for various gear types, as well as data on speed reducing units, motoreducers, and electric hoists. Also contains engineering data section.

**18** ANGLE DRIVE—Payne Dean & Co, Laconia, N. H. 8-page bulletin describes numerous types of universal angle drives made by company, shows how they are applied, and includes brief descriptions on manganese bronze universal joints.

### METERS, INSTRUMENTS AND CONTROLS

**19** CONTROLS — General Electric Co, Schenectady, N. Y. Booklet GEA-4015 is simplified guide to selection and application of commonly used motor controls. Book lists standard controls and describes operation, discusses when to use magnetic and manual controls, and explains when reduced-voltage starting is necessary.

**20** GAGES—Trimount Instrument Co, 37 W Van Buren St, Chicago, Ill. 4-page Bulletin No. 40 lists applications of tank liquid-level gages made by company, as well as installation diagrams and charts showing various models and sizes.

**21** TIMERS—R W Cramer Co, Centerbrook, Conn. 4-page folder lists Cramer timer products, including timer

(*Continued on page* 176)

FIRST CLASS
PERMIT No. 10
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*Looking ahead with Asbestos*

## "...we sure zigzagged that sub dizzy!"

Merchant Seaman Jones talking—and he had plenty to talk about! Skulking periscopes, the white wake of Jap torpedoes, death dancing on every wave; but, boy, the way his ship dodged those long "tin fish"!

A good head of steam; good insulation around pipes and boilers! That's behind all successful sub-dodging; and when Seaman Jones is a civilian again he won't forget that K&M insulation is right on the job, when needed most.

Yes, Keasbey & Mattison 85% Magnesia Insulation is doing an efficient job at sea; and it is also saving heat and fuel—and power—for Industry on land. For in a country at war, power must be conserved and in many plants K&M Insulation has cut the heat loss by 50% or more.

Spurred on by war demands, K&M production of heat insulation is well above its peak in peacetime. Looking ahead with asbestos we are going to keep this new-found production efficiency at work in the "V" years to come.

For only out of full production—and constant research—can come a high standard of living for all, with everyone busy at his favorite work.

* * *

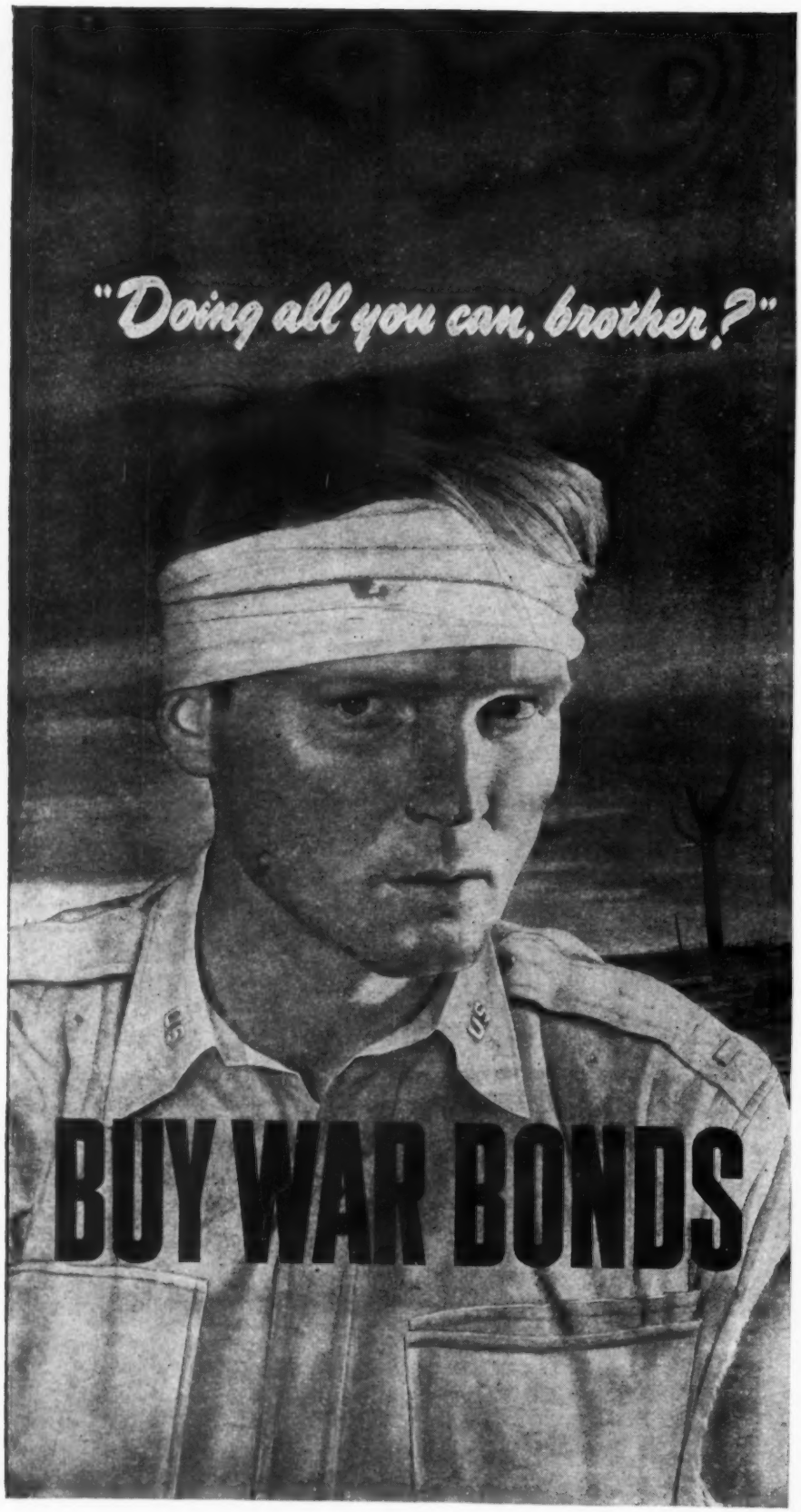
*Nature made asbestos;*
*Keasbey & Mattison, America's asbestos pioneer,*
*has made it serve mankind . . . since 1873*

# KEASBEY & MATTISON
## COMPANY, AMBLER, PENNSYLVANIA

*Makers of*

asbestos-cement shingles and wallboards; asbestos and magnesia insulations for pipes, boilers, furnaces; asbestos textiles; asbestos electrical materials; asbestos paper and millboard; asbestos marine insulations; asbestos acoustical material; asbestos packings; asbestos corrugated sheathing and flat lumbers; asbestos-cement pipe for water mains

K&M best in asbestos




BUELL ENGINEERING COMPANY, Inc.
*10 Cedar Street, New York*
*Sales Representatives in Principal Cities*

CONSULT BUELL *First* IN DUST RECOVERY
for Chemical • Rock Product • Metallic • Food • Flue or any other dusts

buell
DUST RECOVERY SYSTEMS

## New Bulletins

(*Continued from page* 172)

dimensions, housing dimensions, applications, construction and standard features of the Cramer line.

### PIPE, VALVES AND FITTINGS

**23** VALVES—Imperial Brass Mfg Co, 1200 W Harrison St, Chicago, Ill. 4-page folder, No. 858-W, describes the "V" model Watrous flush valve which is said to conserve critical war materials, meets War Department specification PE-623, and gives lasting reliable service. Also contains table which shows flush valve combinations which correspond to various item numbers in above specification.

**24** VALVES—Jenkins Bros, 80 White St, New York, N. Y. 32-page booklet tells which valve to use, differences among various valve types, fundamentals of valve design and application, and where to use by-passes or drains.

**25** INSULATION — Universal Zonolite Insulation Co, 135 South La Salle St, Chicago, Ill. Folder covers company's "Z"crete system of insulating underground pipelines with construction details, specifications, properties, and advantages. Also contains photographs and cross-sectional diagrams.

**26** CASTINGS — Hamilton Foundry & Machine Co, Hamilton, Ohio. 32-page booklet entitled "Quality Piping by Hamilton" describes and illustrates 200 different types of piping produced by company, in both gray iron and Meehanite.

**All literature designated with a star (★) may be obtained only by writing directly to the manufacturer on company letterhead, giving writer's name and title.**

★ PIPING MAINTENANCE — Crane Co, 836 S Michigan Ave, Chicago, Ill. Six-page folder entitled "Short Cuts to Faster Piping Jobs" provides helps in meeting piping material shortages, and describes and illustrates a few examples of war-time piping ingenuity. One section tells how to get piping jobs done in the face of material shortages. Bulletin presents a few hints on using alternate materials, and on war-time installation practices. Ask for "Piping Pointers," Bulletin No. 6.

### PRIME MOVERS AND EQUIPMENT

**27** HEAT EXCHANGERS — Downingtown Iron Works, Heat Transfer Div, Downingtown, Pa. 4-page folder introduces company's Shellfin heat exchangers with photographs, diagrams, sectional views and dimensions. Typical uses include lubricating-oil cooler, jacket-water cooler, vapor condenser, aftercooler, gas cooler and miscellaneous general process duties.

**28** TURBINES — General Electric Co, Schenectady, N. Y. Bulletin No. GEA-1145-B, 20 pages, describes Type D mechanical drive turbines with general specifications, charts, sectional diagrams and photographs showing construction features, advantages and modifications that make Type D turbines adaptable to special requirements.

**29** OIL PURIFIERS — Honan-Crane Corp, Lebanon, Ind. 20-page manual on the installation and operation of Honan-Crane oil purifiers, covers following subjects: principles of operation; placing purifier in operation; details of installation, causes of improper operation, etc.

**30** DIESEL ENGINES — Worthington Pump and Machinery Corp, Harrison, N. J. 12-page bulletin No. S-500-B36B covers type CC diesel engines with specifications, auxiliaries, application data, cooling equipment, principal dimensions, and ratings. Also includes photographs and cross-sectional diagrams.

### PUMPS

**31** ROTARY PUMP — Blackmer Pump Co, Grand Rapids, Mich. 24-page

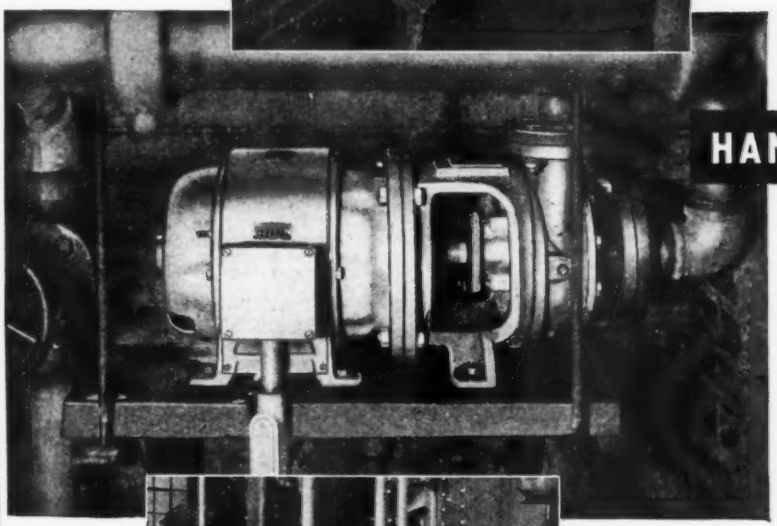
# WHERE PUMP SPACE IS LIMITED... *Try These Ideas*

## MOUNT IT ON THE WALL

*The oversize bearings in the Motorpump assure just as trouble-free operation in a vertical as in a horizontal position.*

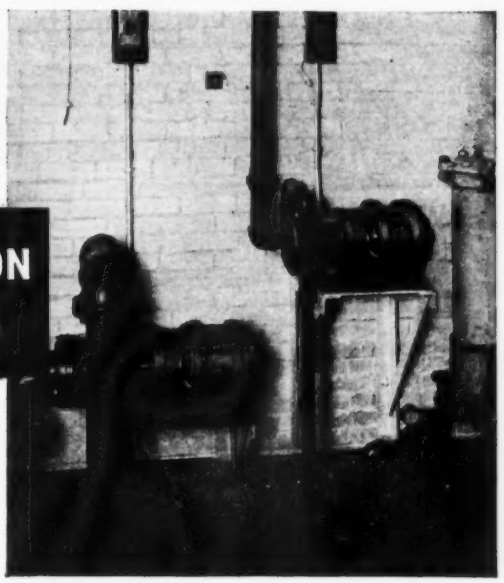
The Motorpump is a 24-hour-a-day pumping unit. Pump and motor are built together on the same shaft, making it unusually compact and rigid.

It is available with motors from ¼ to 40 hp to handle from 5 to 1800 gals per min against pressures as high as 215 lb per sq in. Suitable modifications and accessories are available for special pumping applications and difficult-to-handle liquids.



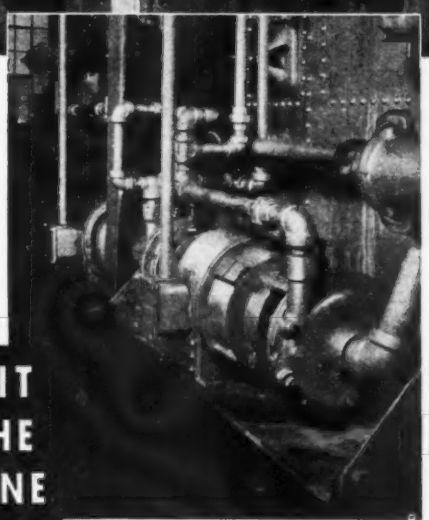
## HANG IT FROM THE CEILING

*The compact construction of the Motorpump makes it possible to use many space saving ideas.*



## PLACE IT ON BRACKETS

*Brackets not only save space but also bring the pump up to a convenient height.*



## PUT IT ON THE MACHINE IT SERVES

*This idea saves space and reduces piping and foundation expense as well as adding to the convenience.*

**Ingersoll-Rand**

CAMERON PUMP DIVISION

9-200 11 Broadway • New York, N.Y.

# FLEXPEDITE

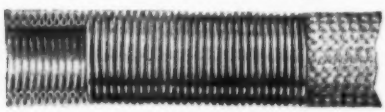
**Your Conversion—Assembly—Production**

**with**

# REX-WELD

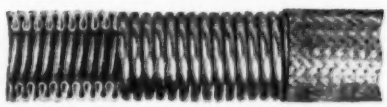
## Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations



RW-80 Unbraided — RW-81 Braided

Rex-Weld Hose—Helical Corrugations



RW-90 Unbraided — RW-91 Braided

### General Data

| | STEEL | BRONZE |
|---|---|---|
| Sizes | To 4" I.D. | To 4" I.D. |
| Pressures | To 14,500 p.s.i. | To 14,500 p.s.i. |
| Temperatures | To 1000° F | To 450° F. |
| Lengths | To 50' | To 50' |

### Use Chart

| | *STEEL | BRONZE |
|---|---|---|
| Saturated Steam | | ✓ |
| Superheated Steam | ✓ | |
| Sulphur Bearing Oil | ✓ | |
| Oxygen | | ✓ |
| Ammonia | ✓ | |
| Carbon Dioxide | ✓ | |
| Sulphur Bearing Grease | ✓ | |
| Critical Vibration | | ✓ |
| Non-Sparking | | ✓ |

*Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).*

**Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.**

*Ask for Engineering Recommendations*

**CHICAGO METAL HOSE CORPORATION**

General Offices: MAYWOOD, ILLINOIS

*Factories: Maywood and Elgin, Ill.*


booklet in two colors presents story of "bucket design," basic pump units made by company, and various applications in petroleum, chemical, paint, food and marine fields. Gives individual descriptions on power pumps (single units) also power pumps (multiple units), truck pumps, sanitary pumps, direct-connected pumps, hand pumps (capacities 7 to 25 gpm), and technical data on all Blackmer pumps.

**32** SPEED PRIME PUMP—Chain Belt Co, Milwaukee, Wis. 24-page bulletin presents Rex Jr speed prime pump with 3000 gph capacity. Bulletin covers design principle of prime control valve, suction valve, as well as brief descriptions of 2-, 3-, 4-, 6-, and 8-in. pumps also manufactured by company.

### WATER TREATMENT

**33** COOLING TOWERS—Marley Co, Inc, Kansas City, Kans. 20-page bulletin No. 603 describes conventional type induced-draft cooling towers, with color photographs and diagrams. Also discusses other company products such as fans, rings, gear reducers, drive shafts, etc.

**34** HOT PROCESS SOFTENER—Cochrane Corp, Philadelphia, Pa. 28-page bulletin No. 3087 lists hot-process water softeners in mining, transportation, public utilities, food and metal industries. Also contains list of high-pressure plants using softener.

**35** WATER TREATMENT — Illinois Water Treatment Co, 840 Cedar St, Rockford, Ill. 4-page booklet introduces new chemical method of deionizing water, which is said to replace distilled water at fraction of cost. Installation and operation illustrated with photographs. Method is used in process industries, aircraft plants, synthetic rubber plants and distilleries.

**36** WATER TREATMENT—Infilco, Inc, 325 W 25th Pl, Chicago, Ill. 12-page Catalog No. 1834, "The What, How and Why of the Accelator" contains description and explanation of accelator process and design, accompanied by operating data from twenty representative installations confirming performance advantages. Also contains tables of operating data, and lists other Infilco products.

**37** WATER TREATMENT — International Nickel Co, Inc, 67 Wall St, New York, N. Y. Corrosion data worksheet acts as check list to insure consideration and evaluation of oil factors influencing corrosive action. Also permits comparison of problems with similar ones which may be used as guides for selecting materials possessing satisfactory resistance.

**38** WATER TREATMENT — Cochrane Corp, Philadelphia, Pa. 36-page booklet treats clay type deaerators—atomizing deaerators, deaerating hot water generators and low water deaerators. Booklet sections are devoted to corrosion and pH control. Cross-sectional photographs and line diagrams, in color clarify deaerator operation. Also illustrates and describes accessory equipment showing importance of accessories in maintaining operation of power plant.

### WELDING

**39** FLAME ADJUSTMENT — Air Reduction Sales Co, 60 East 42nd St, New York, N. Y. Chart for oxyacetylene flame adjustment shows natural color photographs of five fundamental flame adjustments: (1) Acetylene burning in air; (2) a strongly carburizing flame; (3) slight excess of acetylene flame; (4) neutral flame; and (5) an oxidizing flame. Chart is said to convey the proper appearance of the various welding flames faster and more accurately than descriptive instructions.

**40** WELDING—Aluminum Co of America, Pittsburgh, Pa. 100-page spiral-bound volume, completely rewritten edition of welding booklet, incorporates art of brazing. Subjects covered include gas welding, arc welding, instruction and specification of gas and arc welding, and electric-resistance welding. Booklet contains many shop diagrams.

**41** WELDING — Lincoln Electric Co, Cleveland, Ohio. 42-page booklet entitled "Factors Affecting Increased Welding Production" is divided into fifteen sections, each of which contains

# "SHORT-COUPLED--LIKE A POLO PONY"

**said an engineer about the new Elliott 1300 Series tube cleaner. A good polo pony can "turn on a ten-cent piece" as the saying is — and this new cleaner with its hinge coupling can do almost that.**

**MORE POWER IN A SHORTER COUPLED MOTOR** because of new design factors and the new Elliott lubrication system. Elliott tube cleaner engineers have succeeded in designing a combination, which will get around close radius tube turns, and at the same time deliver a greater flow of smooth power streamlined to the cutter heads.

**THE NEW HINGE COUPLING— ANOTHER ELLIOTT ACHIEVEMENT** easily and automatically adjusts the connection of hose and motor to any angle within a wide range, required by the tube turn. The hinge coupling is airtight in any position, strong, permanently assembled. It is a new and distinct addition to the ease of tube cleaning operation.

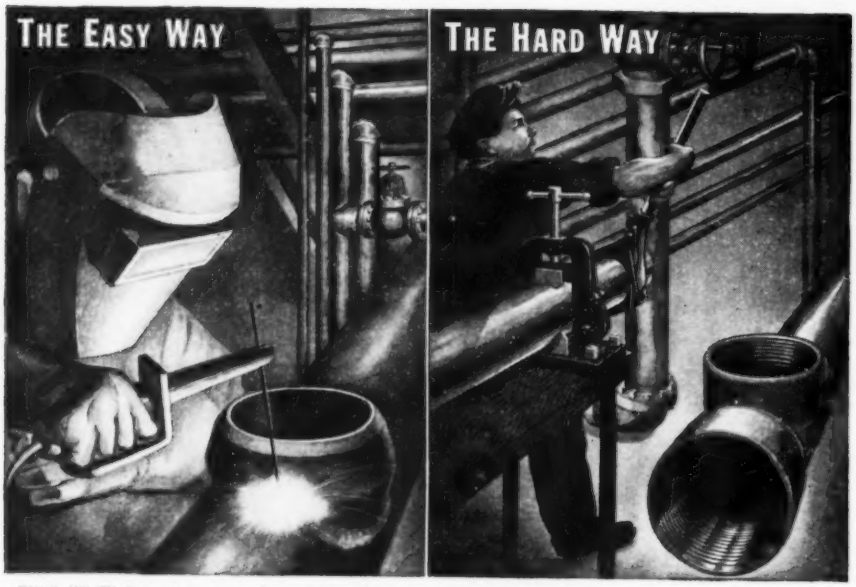
***Get all the details on these and other advances in tube cleaning equipment. Write.***

THE *New*
# ELLIOTT
## *1300 Series*
## TUBE CLEANER

**ELLIOTT COMPANY**
*Tube Cleaner Department*
**SPRINGFIELD, OHIO**
*DISTRICT OFFICES IN PRINCIPAL CITIES*

Y-201

# How W-T's* Speed Up Piping Installations For War Production




With W-T's* you simply select the position of the outlet on the main pipe and weld the fitting into place, either before or after erection of the main line. The hole is usually cut in the main pipe with the torch after the fitting is installed.

Old-fashioned methods of cutting, forming and fitting the main pipe for installation of a tee are eliminated with W-T's*—saving time and money. W-T's* provide a simple, fast, economical way to make right-angle, welded branch pipe outlets.

## Advantages of W-T's*

Eliminate templets and preliminary layouts.

Eliminate cutting, forming and fitting of main line.

Provide leakproof joints of full pipe strength.

Improve flow conditions—reduce turbulence and friction.

Interior of outlet open for inspection after installation.

Eliminate need for extra supports, braces at line of junction.

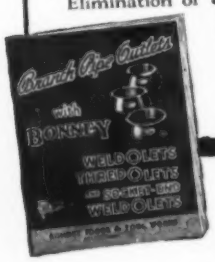
Light weight — save metal — reduce total weight of system. Metal saved is additional help to war effort.

Suitable for all commonly used pressures and temperatures.

Suitable for "on-the-job" assemblies or prefabricated systems—new construction or maintenance.

Elimination of exterior obstructions makes neater, more workmanlike installation, permits easier covering with insulation.

Installed with electric-arc or oxy-acetylene method by any welder of average ability.




Write for this 16 page bulletin giving complete details of all their advantages. Ask for Bulletin WT-31.

## 3 Types Meet Every Need

Beveled outlet of WELDOLETS permits branch pipe to be attached with plain, circumferential, butt weld.

Threaded outlet of THREDOLETS permits branch pipe to be screwed into outlet of fitting.

Outlet of SOCKET-END WELDOLET is bored to accept standard outside pipe diameters. Junction is completed with weld around top of fitting.

All of the fittings give you all of the advantages shown. They are available for all standard pipe sizes up to 24".

*WeldOlets-ThredOlets

*Forged Fittings Division*

**BONNEY FORGE & TOOL WORKS, Allentown, Pa.**

WELDOLETS·
TRADE MARKS - REG. U. S. PAT. OFF.
THREDOLETS
*Welded Outlets for Every Piping System*


up-to-date information concerning specific phases of arc welding. Also contains charts and tables helpful in choosing correct electrode, applying most suitable welding technique, estimating speeds and costs of various welding jobs, and other data that will produce best possible results, reduce costs and increase welding protection.

**42** PIPE WELDING — Air Reduction Sales Co, 50 East 42nd St, New York, N. Y. 16-page booklet entitled "The Welding of Piping," consists of a series of articles prepared by company's applied engineering department. Comprehensively covers various types of ferrous and nonferrous piping, dimensions, fabrication and estimates of labor and welding costs.

### OTHER EQUIPMENT

**43** PACKING—Walker-Rains Co, 518-18th St, Denver, Colo. 16-page catalog tells story of triple-duty Supreme packing, with specifications for installation in breweries, canning factories, heating plants, hydraulic power plants, machinery manufacturers, steam power plants, water systems, etc. Booklet also contains instructions for installing packing.

**44** PACKING—Wayne Davies & Co, 325 W Huron St, Chicago, Ill. Operating analysis chart for scientific specification and accurate shop record of hydraulic and pneumatic U-packing gives detail on hydraulic service improvements developed by company with data and information enabling maintenance engineers to determine exact requirements and dimensions for every condition. Bulletin mentions ten specific don'ts when ordering and installing Davies packing.

**45** ROOFS AND SIDINGS—Felt-Cote Division, American Steel Band Co, Pittsburgh, Pa. 24-page spiral-bound book describes all types of Felt-Cote asbestos-protected metal roofs and siding for industrial building. Separate section gives general diagram and details of Self-Cote construction. Special section presents data on how to specify the metal roofing and siding.

**46** COATINGS—J W Mortell Co, Kankakee, Ill. 82-page handbook tells how to prevent and cure damaging condensation and sweat that forms on metal pipes and fixtures, basement walls, ceilings, concrete, wood, castings, etc. Instructions on application, coverage, drying time and complete listings of many uses for Nodrip coating and other pertinent data—all contained in this book.

**47** METALS AND ALLOYS—Allegheny Ludlum Steel Corp, Pittsburgh, Pa. 128-page spiral-bound booklet, entitled "Handbook of Special Steels, Their Properties and Uses", covers tool steels special products, nitralloy steels, stainless steels, electrical steels, and carbon steels. Also contains tables and reference material.

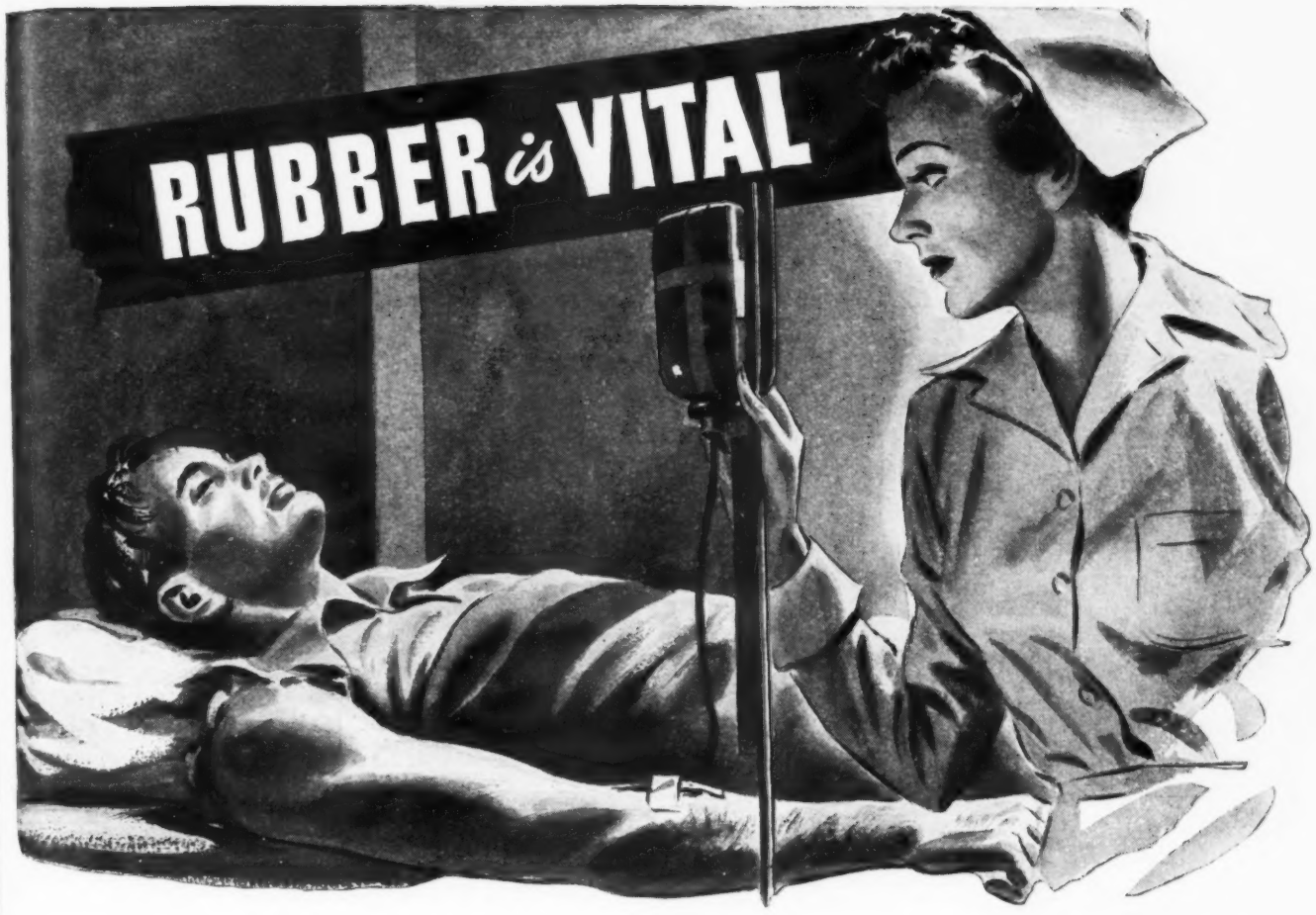
**48** METALS — Allegheny-Ludlum Steel Corp, Brackenridge, Pa. 28-page data book entitled "Tool Steels, an Elementary Discussion", lists different steels and alloys with applications and recommended types, heat treatment and handling, and forms available.

**49** ALLOYS—Handy & Harman, 82 Fulton Street, New York, N. Y. 18-page bulletin No. 12-A, revised edition of general catalog, discusses low temperature brazing of metals with Sil-Fos and Easy-Flo used in manufacture of air conditioning, refrigeration and electrical equipment. Also contains photographs, diagrams and tables of specifications and standard sizes.

**50** LUBRICATION — Acheson Colloids Corp, Port Huron, Mich. Bulletin No. 430-AU, 12 pages, discusses importance of "dag" colloidal graphite in modern industries. Physical and chemical properties are outlined. Points out that product may be used as lubricant for running-in engines, for high temperatures, for impregnating porous bodies and for electrical applications.

**51** SAFETY—Alexite Engrg Co, Alexander Bldg, Colorado Springs, Colo. Single-page leaflet describes Alexite absorbent floor compound, (formula 3-43), which is said to be fibrous, sanitary and non-skid and thus help accident prevention.

**52** SAFETY EQUIPMENT — Boyer-Campbell Co, Detroit, 6540 Antoine St, Detroit, Mich. 134-page Catalog No.




# —for saving lives—for producing war materiel

WHILE YOU read this message, somewhere behind a firing line the life-sustaining blood of some patriotic donor is flowing into the veins of a casualty—*through a tube of rubber.* And, in the factories of America making planes and tanks and guns, most of the machines are driven by "V" belts—*also made of rubber.*

Yes, rubber is indeed vital for victory, and our stock pile is dwindling. Every pound saved by conservation makes that much more available for essential needs—at the front and at home.

Every additional month of service life obtained from the thousands upon thousands of Multiple V-Belt Drives, is in the aggregate, a saving well worth while. You'll find authoritative advice on this important subject in "23 WAYS TO CONSERVE THE LIFE OF YOUR MULTIPLE V-BELT DRIVES"—a handbook prepared by the Engineering Research Bureau of the Association and distributed free of cost to the power users of the nation.

Look up your copy and put its recommendations into practice. Postpone unnecessary replacements. You'll save money and save rubber for your country.

TRADE MARK

*The use of this emblem by an association member in connection with Multiple V-Belt Drives is your assurance of mechanical excellence . . . the result of cooperative engineering, research and experience.*

**MULTIPLE V-BELT DRIVE ASSOCIATION**

140 SOUTH DEARBORN ST., CHICAGO

*Write for this FREE Association Book Today!*

# How to obtain ALL-OUT savings, better performance, from your flush valves

THESE are days when the performance of flush valves should be checked carefully. For example, by making sure that every flush valve is properly adjusted, tremendous *extra* savings of water can often be obtained. (Such savings contribute to fuel and power savings; help the war effort.) Moreover, proper maintenance can often eliminate the need for repair parts that are made of critical materials.

To meet the need for more information on the whole subject of flush valve maintenance, the Imperial Brass Mfg. Company has published a 16 page manual—"Keep 'Em Flushing." It shows how a flush valve operates—how to get maximum water savings from flush valves—how to keep maintenance time at a minimum. Includes a helpful "Trouble-Shooter" Chart and other practical data.

***Write for your copy***

**THE IMPERIAL BRASS MFG. CO.**
**514 South Racine Ave., Chicago, Illinois**

# Watrous Flush Valves


50 lists, describes and illustrates company's complete line of equipment for accident prevention. Lists all types of aprons, breathing apparatus, applications, bandages, safety guards, safety clothing, goggles, fire-fighting masks, first-aid kits, and other welding equipment and types of safety accessories.

**53** CONSERVATION — Westinghouse Electric Mfg Co, East Pittsburgh, Pa. 96-page booklet, "War-Time Conservation," contains recommendations for selecting, applying and using electrical equipment to achieve best possible output with greatest saving in critical materials. Book covers up-rating of motors, normal temperature loading of transformers, industrial network systems, line equipment and materials, and gives tips on saving and salvaging material.

**54** BALANCING MACHINES — Bear Mfg Co, Rock Island, Ill. 16-page loose-leaf bulletin describes Bear dynamic balancing machines for precision balancing of rotating parts. Illustrates in color several machines available, gives special features of different models, and presents specifications for all models. Also includes general information on the machines, which gives data needed for quotations, and motor types available with each unit.

**55** PRINTER—Peck & Harvey, 4327 Addison St, Chicago, Ill. 4-page leaflet describes Spee-Dee printer for blueprints and black and white prints. Folder presents data concerning printer, price list, and three easy steps to make perfect print.

## Oil Conversion

(*Continued from page* 95)

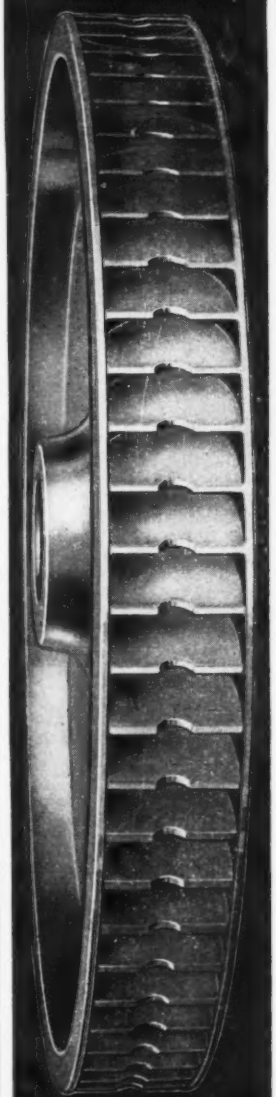
lines represent temperatures with 20% excess air at the burners and various percentages of recirculated flue gas.

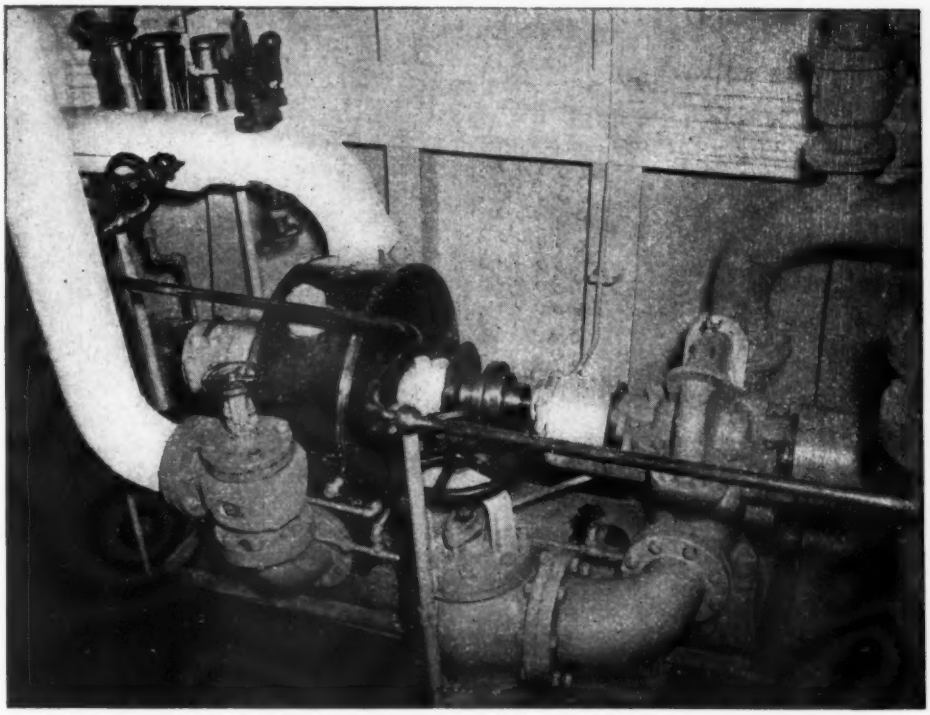
Lower part of Fig. 4 shows efficiencies for the range of tertiary air and recirculated flue gas. Efficiencies with recirculation remain fairly constant as the reduced radiant heat in the furnace and the lower temperature entering the convection surface are almost compensated for by the higher mass flow over the convection surface. Efficiency drops when tertiary air is used because the weight of stack gas increases. In both cases, draft loss is higher and additional weights of air and gas must be handled by the fans. Steam to develop additional fan power has been estimated and deducted from gross-efficiency curves to obtain net-efficiency curves shown.

Under ordinary conditions, cost of operating with reduced output, or the alternate, when it is possible, of adding water-cooled surface, may be justified to avoid loss in efficiency. However, under wartime conditions, recirculation of flue gas may be the only way in which required capacity operation can be continued. When materials are available, water cooling can be added and recirculation discontinued.

For plants where it is difficult to find space for ordinary direct-fired pulverized coal equipment, Mr Hardgrove described the direct-fired circulating system. In this arrangement, the pip-

# TERRY





Above—50 H. P. Terry Solid Wheel Turbine driving Fire and Sanitary Pump on recently completed merchant ship. Steam condition: 450 lbs. 750° TT - 10 lbs.

## FOR AUXILIARY DRIVE — THE TERRY SOLID WHEEL TURBINE OFFERS MANY ADVANTAGES

FROM THE SMALLEST TO THE LARGEST, THESE RELIABLE TURBINES HAVE —

- ★ Indestructible one piece wheel.
- ★ Large radial and axial clearances.
- ★ Double rim protected blading.
- ★ Individual nozzle control.
- ★ Dependable and durable governor.
- ★ Heavy dust-proof bearing and governor housing.
- ★ Independent overspeed trip with separate valve.
- ★ Sturdy casing design.
- ★ Strong and easily inspected steam strainer.
- ★ Truly accessible construction, which makes inspection of the interior parts a simple matter.

FOR FULL DETAILS ASK FOR BULLETIN S-116.

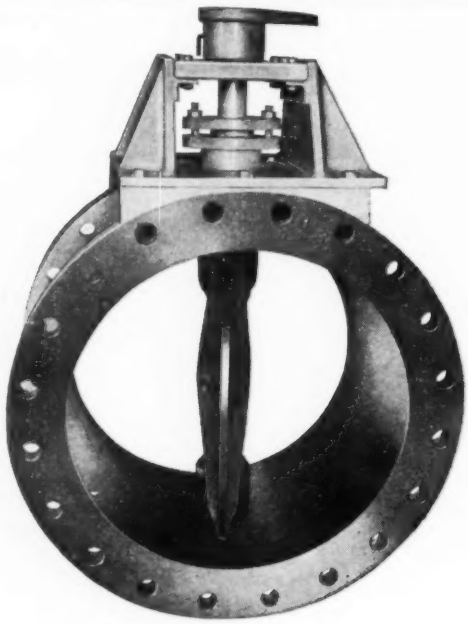
T-1148

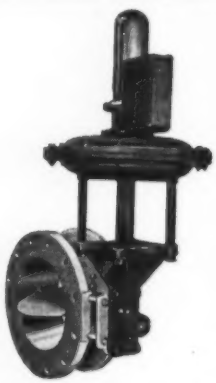
**THE TERRY STEAM TURBINE COMPANY**
**TERRY SQUARE, HARTFORD, CONN.**

# PARTICULARLY well adapted for WATER LINES

**Low Pressure Loss When Open**

Standard 24-inch 125 lb. iron valve with ball crank arm for connection to extended reach rod. Sleeve bearing lubricated stuffing box with cage. When the vane is fully open, flow conditions are similar to those produced in two Venturi Tubes.





Air diaphragm motor for automatic operation—15 pounds pressure.

The pressure loss in a wide open R-S Butterfly Valve is less than in most conventional types of wedge gates. In fact, the streamlined vane is a Venturi maker and is practically self-cleaning. Any member of the R-S Butterfly Valve line will sting the maintenance bill every time.

These valves are accurately machined and are either manually or automatically controlled. The beveled vane seats at an angle against the valve body. There is a size and type for practically any service condition.

**15 to 900 psi**

**SUBSTITUTE METALS**—R-S has developed pressure iron castings for resistance against heat, abrasion and corrosion. They replace vital victory production metals and are considerably lower in price. For instance, R-S "A" Metal, a tough dense metal of high endurance, is used in applications where hard wear and severe stresses are encountered. Has a tensile up to 50,000 p. s. i. and is readily machinable. Write for detailed information and the R-S Butterfly Valve Catalog.

VALVE DIVISION
**R-S PRODUCTS CORPORATION**
4536 Germantown Ave. Philadelphia, Penna.

R-S Streamlined BUTTERFLY VALVES


ing forms a complete loop with coal-and-air mixture tapped off at each furnace as needed. A portion of coal and air carries past the last burner and returns to the pulverizer's base where it mixes with the hot makeup air. Fig. 5 shows a plant with four Stirling and two B & W boilers, having a total steam demand of about 80,000 lb per hr. One pulverizer, outside the building, supplies all units through a circulating system.

**Stokers' place in the changeover:** For many small- and medium-sized plants, hand-firing or stokers represent conversion alternatives. Citing the manpower situation, Mr de Lorenzi strongly recommended selection of automatic or semi-automatic equipment whenever conditions permit. After outlining some general factors in converting from oil- to stoker-firing, he pointed out that equipment selection depends to a large extent on nature of coal to be burned.

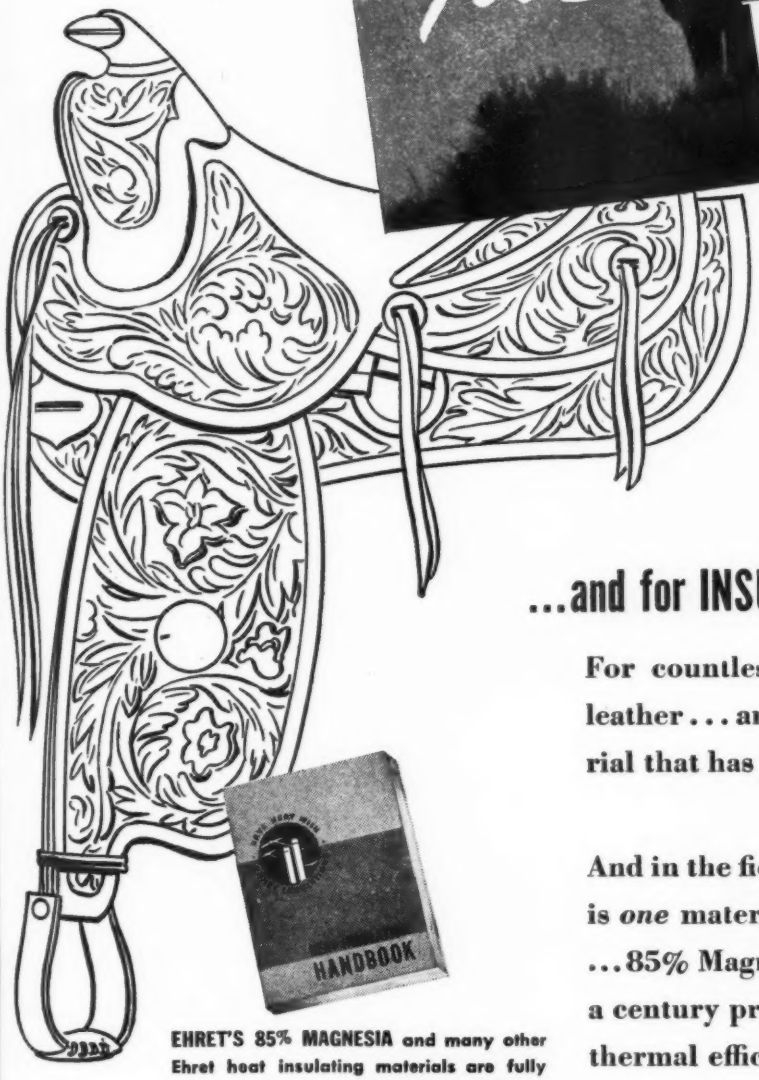
Coal characteristics exerting greatest influence on equipment are: (1) moisture, (2) volatile content, (3) ash quantity and quality, (4) coking properties, and (5) sizing:

Excess moisture may cause difficulty in feeding from hopper to grate on some types of equipment; but in the case of Illinois and Indiana coals, usually burned on chain grates, moisture may be added (tempering) to improve fuel-bed quality.

Promptness with which a fuel ignites, when entering a hot furnace, depends to a large extent on its volatile content. Speed of ignition thus exerts considerable influence on furnace design and method of burning. Low-volatile coals, such as anthracite, give best results on traveling-grate stokers set in furnaces with proper refractory arches. Coals best suited for underfeed and spreader stokers have volatile content ranging from 16 to 40%. Overfire air finds increasing use as a means for avoiding smoke with high-volatile coals.

Both ash quantity and quality are important factors in stoker selection: A minimum of about 6% ash is necessary to protect grate surfaces against overheating. With coals having ash content higher than 6%, ash quality becomes a leading factor. Mr de Lorenzi defined *high-quality* ash as containing less than 15% iron oxide and fusion temperature above 2300 F, and *poor-quality* ash as containing 15 to 25% iron oxide and fusion temperature from 2200 F down. He indicated that coal with high-quality ash suits all stoker types but that traveling-grate and spreader units handle coals with poor-quality ash.

Coals that coke or cake in the fuel bed can be handled on underfeed stok-

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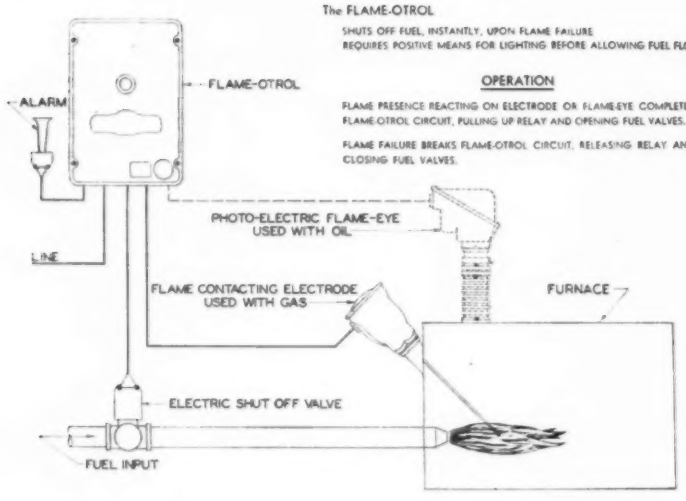
**COMBUSTION EXPLOSIONS**

*. . . . regardless of fuel burned*


The FLAME-OTROL
SHUTS OFF FUEL, INSTANTLY, UPON FLAME FAILURE
REQUIRES POSITIVE MEANS FOR LIGHTING BEFORE ALLOWING FUEL FLOW.
OPERATION
FLAME PRESENCE REACTING ON ELECTRODE OR FLAME-EYE COMPLETES FLAME-OTROL CIRCUIT, PULLING UP RELAY AND OPENING FUEL VALVES.
FLAME FAILURE BREAKS FLAME-OTROL CIRCUIT, RELEASING RELAY AND CLOSING FUEL VALVES.
ALARM
FLAME-OTROL
PHOTO-ELECTRIC FLAME-EYE USED WITH OIL
LINE
FLAME CONTACTING ELECTRODE USED WITH GAS
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ers or any other design employing agitation, and by spreader units when the amount of fuel-bed burning is limited. Free-burning coals—those that do not cake or mat—are best suited to stokers without fuel-bed agitation, such as traveling-grate and spreader designs.

Fuel size assumes increasing importance as a factor governing stoker performance. For single- and multiple-retort underfeed stoker units, Mr de Lorenzi recommended the commercially available 2-in. nut-and-slack; for traveling grates and spreaders, ¾-in. nut-and-slack. In either case, 30% of the fuel should be of the larger sizes.

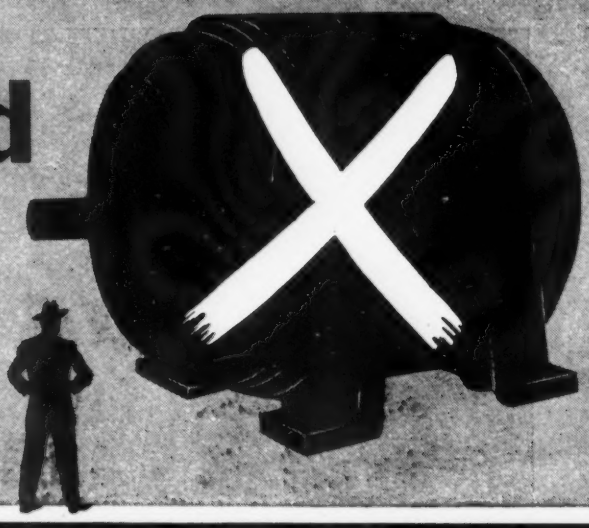
Turning from influence of coal characteristics on stoker selection to stoker types and sizes available, he dealt first with underfeed units: Single-retort underfeeds, available in a wide variety of designs, handle from 300 to 1600 lb per hr; larger units fire boilers up to 50,000 lb per hr steaming capacity. Continuous liberation rates may be as high as 55,000 Btu per cu ft. Because this design's ratio of dump- to active-grate area is quite high, choose stoker size to provide a reasonable burning rate. Distance between fuel bed and nearest boiler surface must be great enough to prevent possible flame impingement. Particularly advantageous characteristics of these stokers are: (1) only shallow ashpits at boiler-room floor level are required, (2) all necessary operation can be carried out from the front, and (3) simplicity of design makes rapid installation possible.

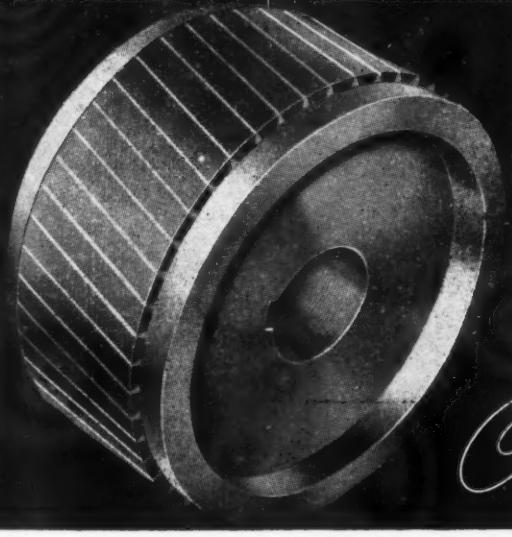
The multiple-retort stoker fits larger installations. It is advisable to limit continuous combustion rates to 35,000 Btu per cu ft per hr and to hold peaks below 50,000. Because ratio of dump- to active-grate area is relatively low, permissible combustion rates are somewhat higher than for single-retort stokers. Ashpits of reasonable size are essential to satisfactory operation.

Traveling-grate stokers provide a continuously moving, non-agitating grate surface, usually set in a furnace with refractory arches to insure prompt ignition, to stimulate turbulence and to mix combustion products uniformly. Fuel-burning rate varies with sizing and ignition characteristics, ranging from about 25 lb per sq ft per hr for No. 4 buckwheat anthracite to as high as 65 lb for lignite.

The spreader stoker uses the combined principles of suspension burning and the non-agitated fuel bed. Coal sizing governs the amount burned by each method. Because only part of the combustion process occurs in the stationary fuel bed, it is necessary to provide liberal furnace volumes. For continuous

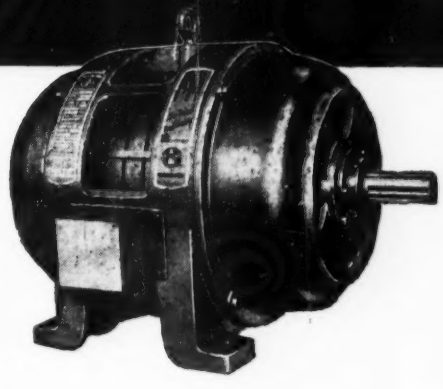
# You don't need Extra Size





# With this Extra Quality

*Copperspun*



● No need to tell you that wartime restrictions make it impossible for you to get extra-size or extra-horsepower motors for any job that calls for specific horsepower.

But don't let that worry you for a single moment. Put Fairbanks-Morse Motors with Copperspun Rotors on the job—and you *do not need* extra horsepower or extra size.

The reason, briefly stated, is this: The winding of the F-M Copperspun Rotor is centrifugally cast, in *one piece,* of pure *copper.* No other rotor is cast of *copper.* Copper has better thermal characteristics. Copper has better electrical characteristics. For these reasons, you can run a Fairbanks-Morse Motor with Copperspun Rotor *under full load indefinitely* without danger of damage through overload.

Naturally you'd rather not buy horsepower you don't need — if you can do so safely. Now you can.

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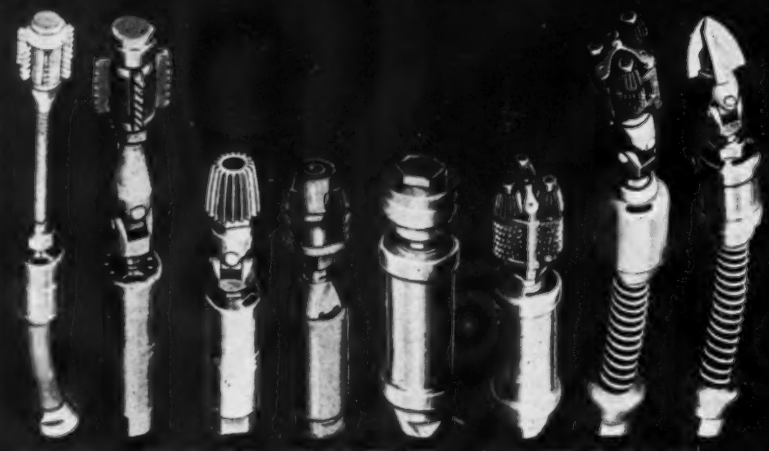
Motors



# WILSON TUBE CLEANERS ARE BUILT TO TAKE IT

For efficient, economical and rapid tube cleaning you *must* have tube cleaners and accessories designed and built to "stand the gaff" of war time operating conditions—when tube cleaning is often put off as long as possible and then must be "rushed through" to get the boiler back on steam without delay. To do a really fast, thorough and economical job of tube cleaning under these conditions you cannot do better than buy Wilson Tube Cleaners and accessories.

Wilson Tube Cleaners have built into them the *extra power, extra speed, extra strength* and *extra efficiency* which enables them to clean straight or curved ferrous or non-ferrous tubes of large or small diameter *faster, better,* and *more economically.* Hundreds of plants producing essential war materials find Wilson Tube Cleaners and accessories invaluable aids in reducing tube cleaning time and trouble.

There is a Wilson Tube Cleaner, cutter head, brush or other accessory for *every* tube cleaning need. Write for the name of our representative nearest to you or ask for a copy of our NEW forty-page catalog which fully describes and illustrates the complete line of Wilson tube cleaning equipment.

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## Put "AMBEST" to a long life test on any tough job

This UNIVERSAL packing—of long, pliable, anti-friction metallic alloy strands—assures low cost, long life packing protection and easy application on any rod in good condition. "AMBEST"—available for all pressures and temperatures up to 550° F.—is recommended for pumps, compressors, engines, throttles and valve stems. All needs are supplied by one packing when you use "AMBEST."

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operation, keep liberation preferably below 40,000 Btu, with a maximum of 60,000 for short-duration peaks.

Flyash carryover with spreader firing depends on burning and liberation rates, also on coal sizing. Proper boiler design provides traps for collecting a large portion of the carryover. With a cinder-return system, it is possible to re-inject this otherwise wasted material into the furnace. Always give consideration to use of a dust collector to trap extremely fine flyash.

## New Equipment

(*Continued from page* 128)

bly screws. There is a marked reduction in weight of complete units as compared with former models using metal housing. *Black & Decker Mfg Co, Towson, Md.*

### Automatic Temperature Control

AUTOMATIC TEMPERATURE CONTROL for Niagara Aero Heat Exchanger, as used for cooling industrial liquids, has been announced. Method is based on controlling amount of outside air passed through evaporative cooling chamber. Accuracy is said to be improved, with cooling effect directly proportioned to load changes. Water savings are increased and there is no settling of solids, restricted flow, or clogging of tubes to interrupt operations. Apparatus comprises recirculating air duct to which outside air is admitted by dampers controlled by thermostat in liquid line where it is in contact with full flow of liquid being cooled. Only minimum

## . . . *the only ALCHLOR PROCESSED turbine lubricant*

You are sure of better turbine protection and higher operating efficiency when you put Gulfcrest Oil in service. For this unmatched turbine lubricant is not only refined by modern conventional methods, but is super-refined by the Alchlor Process, the most effective method yet known for removing impurities and unstable hydrocarbons from oil—the undesirable constituents which cause oxidation and gum and sludge formation.

In addition to purifying the oil thoroughly, the Alchlor Process rearranges the molecular structure of certain of its hydrocarbons, making Gulfcrest Oil a lubricant of highest stability and endurance.

Evidence of the superior quality and higher lubricating value of Gulfcrest Oil is contained in the turbine operating and maintenance records of many of the leading power plants in the country. We suggest that you talk with the Gulf Lubrication Service Engineer in your vicinity about this unmatched turbine lubricant at your first opportunity. He will be pleased to give you complete details—and you will be under no obligation.

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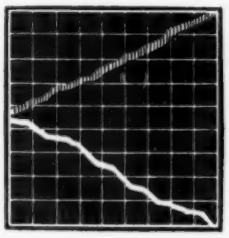
GULF INDUSTRIAL LUBRICATION

# WHEN STEAM IS WASTED

FUEL CONSUMPTION GOES **UP**
PRODUCTION GOES **DOWN**



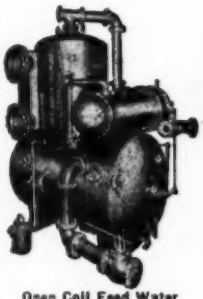
## Stickle Equipment Saves Steam and Saves Fuel

**Stickle Equipment is contributing maximum power to the War Effort. It is designed and constructed to reduce steam cost and to assure the operation of heating and steam processing units at maximum efficiency. The fuel saving Stickle installations are making possible for industrial concerns and the increased production results they achieve are advantages for which Stickle Equipment has been purchased by prudent management for thirty-five years. In our integrated war economy —in which the efficiency of every plant and every man bears directly upon the success of the total effort—its savings reach back to mine and oil well, conserving man power and relieving transportation.**

Steam Traps

**INCREASED PRODUCTION FROM STEAM PROCESSING EQUIPMENT**

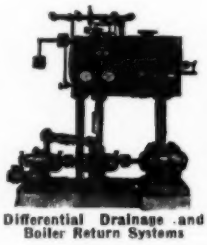
In the food, chemical, lumber, textile, paper, laundry and dry cleaning and other vital industries, Stickle Steam Traps are helping to increase the nation's capacity to produce. They supply the efficient drainage essential to enable steam processing units and heating equipment to meet rated or potential capacities.



Open Coil Feed Water Heaters

**USING EXHAUST STEAM TO PRE-HEAT FEED WATER**

The Open Coil Construction of Stickle Feed Water Heaters is enabling them to heat more water in less space, deliver heated water to the pump within two degrees of the temperature of saturated steam supplied to heater, and furnish a boiler supply of feed water consisting full of one-sixth condensed steam. Saving fuel—protecting boilers—reducing maintenance.



Differential Drainage and Boiler Return Systems

**INCREASING BOILER CAPACITY BY SAVING FUEL**

The Stickle Differential Drainage and Boiler Return System—a closed pumping system—is saving approximately 15 per cent of boiler fuel consumption and increasing boiler capacity proportionately by returning condensate to boilers at only 15 to 20 degrees under temperature of steam at operating pressures.

Reducing and Regulating Valves

**EFFICIENT REGULATION AND CONTROL OF STEAM**

Designed and perfected to meet the exacting requirements in fields calling for control within variations of one-half of one per cent, Stickle Valves are supplying the accuracy, sensitivity, flexibility and dependability necessary for today's operations.

**All items of Stickle Equipment are available in sizes and types to meet practically any application or requirement of the general industrial field. Bulletins available on kind and type of equipment to meet your needs.**

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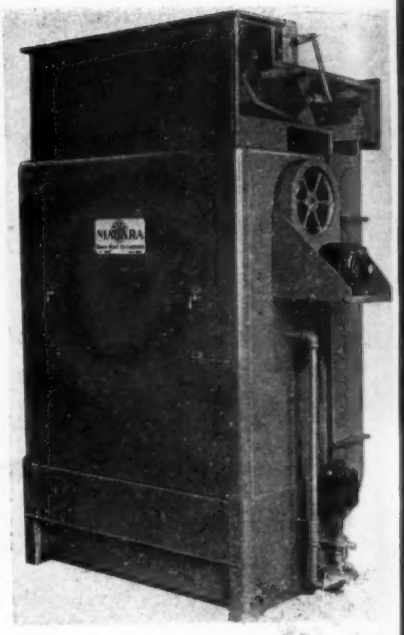
**STEAM SPECIALTIES COMPANY**

**2265 Valley Avenue • Indianapolis, Indiana**

amount of outside air is admitted, keeping spray temperature above freezing. *Niagara Blower Co, 6 E 45th St, New York, N. Y.*

### Floor Stand Hoists

FLOOR STAND HOISTS for screw stem gates, such as are used on canals, reservoirs and other water-controlling projects, are compact, strong, and easy to operate, and include use of finest hardened gears, most efficient seals, and com-

pact anti-friction bearings. Handles are removable. Hoist line offers absolute minimum crank effort for heavy-duty lifting, according to manufacturer. Floor stands have selective two-speed gear ratios. Made in complete range of sizes for different loads. *Rodney Hunt Machine Co, Orange, Mass.*

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CORNING MULTIFORM INSULATORS, in wide range of shapes and sizes and special design features, have been an-

ANNOUNCING--AFTER 30 MONTHS OF DEVELOPMENT--

# the only complete line of motors in which all types in any one frame size are interchangeable and similar in appearance!

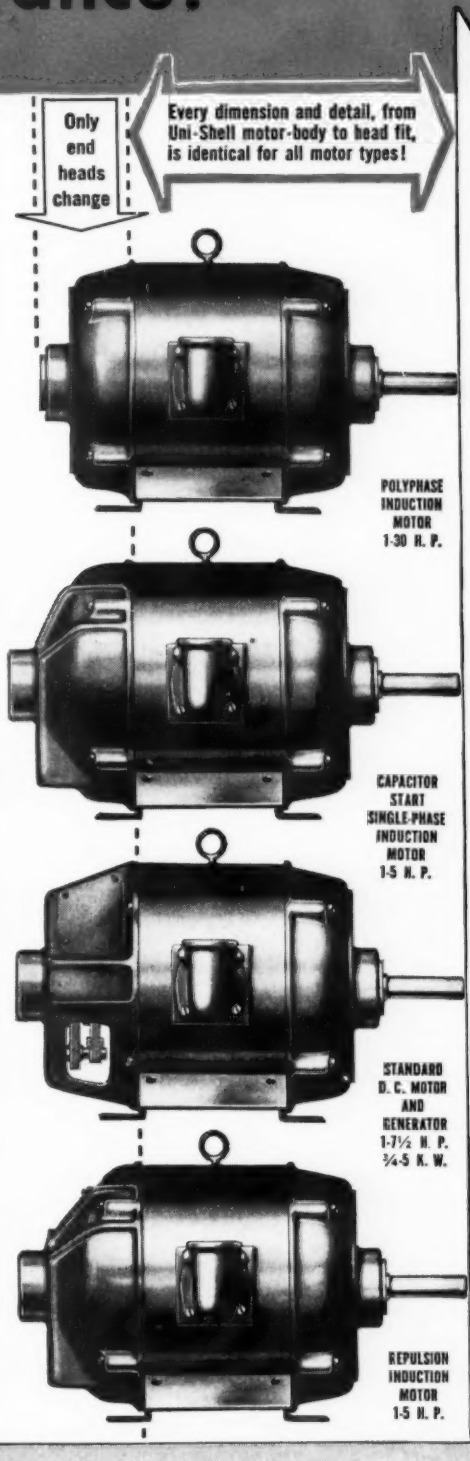
## ROBBINS & MYERS *Uni-Shell* MOTORS

Here's one of the biggest improvements in electric motors in years! Greater interchangeability of *all motor types* than has ever been known before!

Within cylindrical shells of steel we are building not only the finest line of motors we've produced in nearly 50 years, but motors that—for any one frame size—have *identical* shell dimensions, head fit, bolt circle holes, base, shaft size, and conduit box mountings. Where one type of Uni-Shell Motor can be mounted, so can any!

In development for 30 months, and thoroughly tested and proved in hundreds of grueling war-production applications, R & M Uni-Shell Motors embody many other improvements, too, that contribute to longer life, greater dependability, and higher efficiency. New insulating techniques, combined with the finest materials obtainable, keep interior temperatures *below* guaranteed minimums. Better bearings and better balancing assure unusually smooth, trouble-free operation. And we have utilized our broad fan-building experience to make interior ventilation better than ever.

Whether you use motors as part of your product, or only on the machines in your plant, the advantage of *interchangeable motor types* is obvious. The other advantages offered by Uni-Shell Motors will be obvious, too, when you know the whole story. Read the back of this page and then mail the coupon for *your* copy of our 20-page, fully illustrated booklet!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Every dimension and detail, from Uni-Shell motor-body to head fit, is identical for all motor types!
POLYPHASE INDUCTION MOTOR 1-30 H. P.
CAPACITOR START SINGLE-PHASE INDUCTION MOTOR 1-5 H. P.
STANDARD D. C. MOTOR AND GENERATOR 1-7½ H. P. ¾-5 K. W.
REPULSION INDUCTION MOTOR 1-5 H. P.

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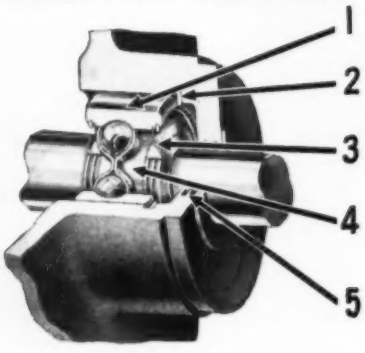
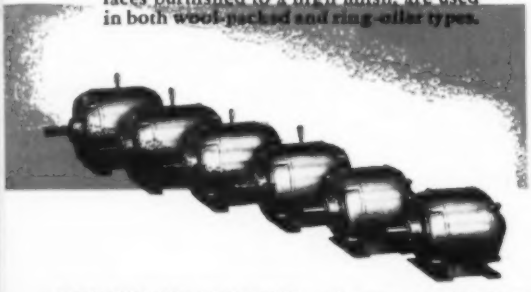
# 3 OTHER IMPORTANT FEATURES
# ROBBINS & MYERS *Uni-Shell* MOTORS
## MAKE OUTSTANDING

## 1. BETTER BEARINGS

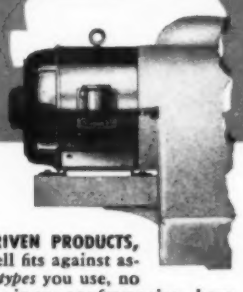



**1.** Double-row-width ball bearing assures an adequate supply of lubricant. **2.** Spacing washer. **3.** Complete seal, both sides—held in by snap rings that are easily removed for inspection, cleaning and regreasing. The lubricant sealed in—dirt sealed out! **4.** Exceptionally large grease reservoir. **5.** Annular grooves filled with water-resistant grease to exclude water, dirt, fumes and other foreign matter.

One of the two main reasons for motor deterioration is *bearing wear*. That is why we have gone "all out" on bearing standards, types, and alignment for Uni-Shell Motors. The bearing illustrated above is standard on all Uni-Shell ball-bearing motors. Equally important improvements have been made on sleeve bearings for Uni-Shell Motors requiring them. Highest-quality cast bronze bearings, with surfaces burnished to a high finish, are used in both wool-packed and ring-oiler types.

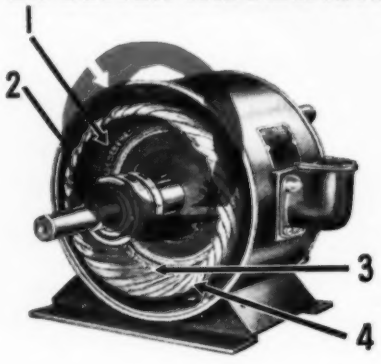


**FROM SMALLEST TO LARGEST,** all types of Uni-Shell Motors look alike. From an appearance standpoint, this "family resemblance" is a distinct advantage for manufacturers using different sizes and types of motors in motor-driven products and on production machines.



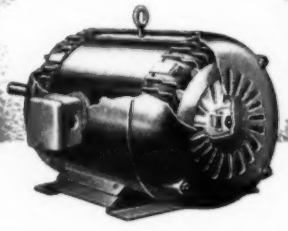
**FOR MAKERS OF MOTOR-DRIVEN PRODUCTS,** this shows how the Uni-Shell fits against assembly. Whatever different *types* you use, no redesigning is necessary. All—in any one frame size—have *identical* shaft-head, shell, and mounting dimensions!

## 2. BETTER INSULATION

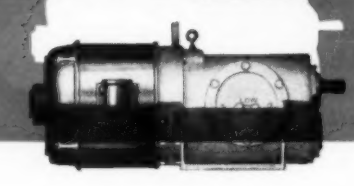



**1.** Two layers of highest-grade impregnated rag paper. **2.** Wire itself coated with double-weight synthetic resin for strength and flexibility. **3.** Added sheet of impregnated paper placed between coils in slot. Improved method used for holding end coils. **4.** Entire winding assembly given several baked coats of synthetic resin-base varnish and covered with moisture-resistant synthetic resin and tung-oil sealer.

The second main reason for motor deterioration is two-fold: *poor insulation* and *excessive heat*. Consequently, throughout Uni-Shell Motors, we use the best insulating materials that can be purchased, incorporating the newer synthetic varnish treatments as outlined above. On all heat runs, temperature rise is measured by embedded thermo-couples to give the complete, *accurate* picture for each design. Heat vitally affects motor life. Our records show that Uni-Shell Motors give *better* than guaranteed values.

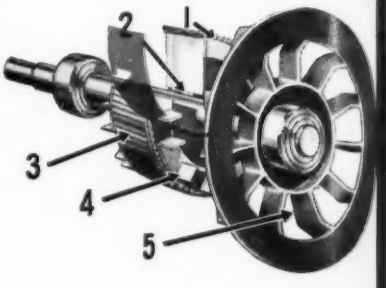


**TOTALLY ENCLOSED, FAN-COOLED UNITS** have covering shell that bolts to standard base, special ribbed end heads for maximum heat dissipation, and special fan that gives large flow of air between enclosed Uni-Shell Motor and outer cover. Cast conduit box is thoroughly gasketed.



**UNI-SHELL MOTORS USED IN PRODUCTS** manufactured by Robbins & Myers. This includes hoists and cranes, Moyno pumps, and machine drives, all famous for their trouble-free performance. Buyers of these products also benefit from the Uni-Shell's interchangeability.

## 3. BETTER BALANCE and ROTOR CONSTRUCTION

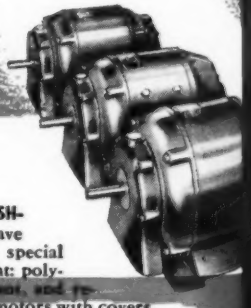



**1.** Welded or brazed bars and end rings are copper. **2.** Rotor keyed to shaft. **3.** Ground rotor surface assures uniform air gap and quiet operation. **4.** Pressed-steel fans are used against rotor for larger ratings, as well as on totally enclosed motors. **5.** Our fan engineering experience has been applied to designing and testing all fans used in the Uni-Shell. A measured flow of air is assured on all designs.

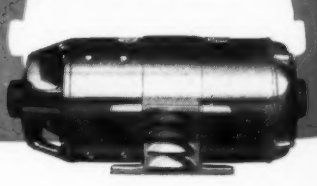
Good bearing alignment and rotor construction, together with precision balancing, prevent motor vibration that injures bearings and shortens their life. Three grades of rotor balance are available on all types of Uni-Shell Motors:

1. Static balance.
2. Commercial dynamic balance.
3. Special dynamic balance.

Precision balancing machines of the newest types are used in building Uni-Shell Motors. Vibrometers check the smooth-running performance of each one.



**DRIP-PROOF, SPLASH-PROOF MOTORS** have covers added, or special heads. Left to right: polyphase, direct current, and repulsion induction motors with covers.



**UNI-SHELL MOTOR AND GENERATOR SETS** are made open, drip-proof, splash-proof and protected styles. totally enclosed union ring set, cooled by a unique pr ple, illustrates streamlined compactness made possibl Uni-Shell construction of both motors and gener

**ROBBINS & MYERS, INC.,** SPRINGFIELD · OHIO

Gentlemen: Please send me your new 20-page booklet on Uni-Shell Motors.

Name.....Position.....

Company.....

Street Address.....

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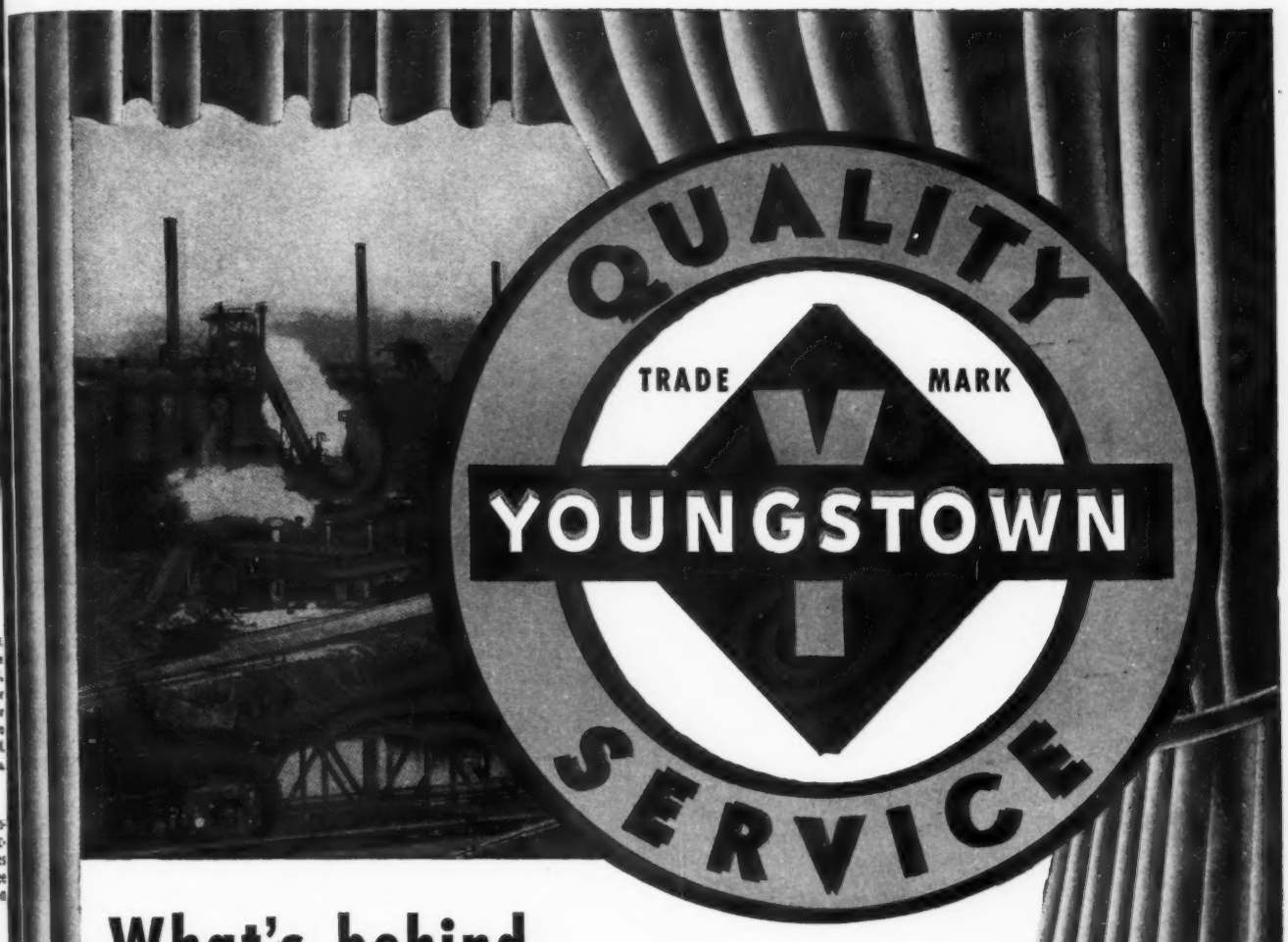
*Mail this Coupon today*




# What's behind the TRADE MARK?

BEHIND the trade mark of The Youngstown Sheet and Tube Company is an interesting story. Founded in 1900, its career is a typical American achievement, representing 43 years of steady, substantial growth. As the original plans of its founders have gradually unfolded, Youngstown has been permitted to make material contributions to the welfare of the nation.

Integrity of purpose, courage, ability, a spirit of venture, the will to serve its customers—these are some of the things that give life and substance to the Youngstown trade mark. They have built the company from its small beginning with only a few thousand tons capacity to a position among the leaders in 1943—with an annual capacity of 4,000,000 tons of steel.

We here at Youngstown are devoting our energies 100% to meeting the emergencies of war now as we did in World War I. When peace comes, we shall devote all our resources to the requirements of our thousands of customers old and new.

**The YOUNGSTOWN**
**SHEET AND TUBE COMPANY,** *Youngstown, Ohio*
Manufacturers of
CARBON · ALLOY AND YOLOY STEELS

Pipe and Tubular Products • Sheets
Plates • Conduit • Bars • Tin Plate
Rods • Wire • Nails • Tie Plates and
Spikes • Alloy and Yoloy Steels

23-47F

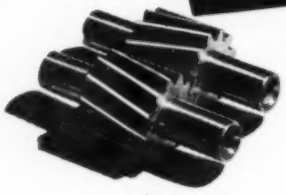
# Here's one Reason ROPER PUMPS Last Longer

ONLY 2 MOVING PARTS

**HANDLE ANY LIQUID FROM A TO Z**

Alcohol, Asphalt, Bilgewater, Boiler Compound, Catsup, Chocolate, Cresote Oil, Drugs, Dyes, Essential Oils, Fruit Syrups, Fuel Oil, Gasoline, Glue, Hot Lard, Ink, Kerosene, Lacquer, Lubricating Oils, Molasses, Naphtha, Olive Oil, Paints, Peanut Butter, Petroleum, Quenching Oils, Road Oil, Rubber Cement, Shellac, Soap, Syrups, Tarvia, Tomatoes, Varnish, Water, Yeast, Zinc Nitrate

★ It makes no difference how thin or how thick, a Roper will do the job. Any liquid free from abrasives can be pumped with economy and efficiency.



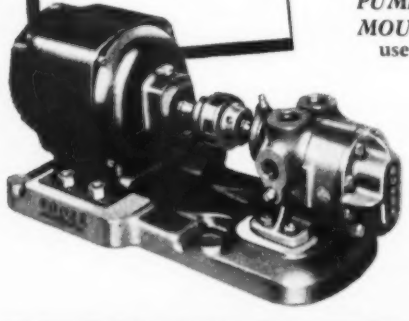
★ The ROPER PRINCIPLE is the simplest ever designed. It has only two moving parts—EQUAL SIZE PUMPING GEARS operating at same speed.

When this principle was introduced it was the most economical and satisfactory way to move liquid. It was new then—it's new now because any product that does a job in the best way a job can be done is never old.

Over eighty years experience has proved the ROPER PRINCIPLE basically sound and so absolutely right that nothing could be changed to make it better. Improvements are continually being added to the pump but the principle remains unchanged.

HYDRAULICALLY BALANCED

THIS SEAL means higher efficiency, quieter operation, greater dependability and longer life.



## QUICK FACTS

*CAPACITIES*—1 to 1000 gallons per minute.
*PRESSURES*—up to 1000 lbs. per square inch.
*SPEEDS*—up to 1800 revolutions per minute.
*BEARINGS*—sleeve or roller.
*PACKING BOXES*—mechanical seal or packed type.
*PUMPING GEARS*—spiral or spur tooth.
*MOUNTINGS AND DRIVES*—for any practical use including hand-operated units.

SEND FOR *Free Catalog*

Our new catalog is complete with cutaway views, performance data, dimensions, weights and pertinent engineering information. Write for it today—Catalog 544.

ROPER *Rotary* PUMPS

GEO. D. ROPER CORP., ROCKFORD, ILL.

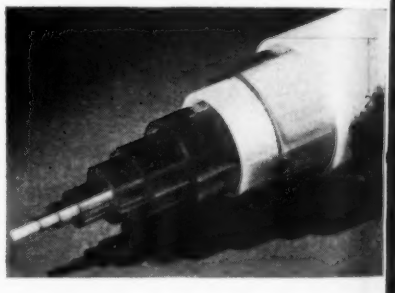

nounced. Among advantages claimed are minimum frequency drift, negligible water absorption, and low loss factor. Multiform insulation products already include radio coil forms, capacitor bushings, rest bar insulators, condenser spacers, various beads and wafers, and many other electrical and industrial parts. *Corning Glass Works, Corning, N. Y.*

## Fluorescent Lamp Ballast

THREE-LAMP, 40-WATT, HIGH-POWER-factor ballast for fluorescent lighting in war plants has been announced. New ballast is better adapted to installation in a fixture than two separate ballasts, and the use of one simplifies installation and reduces amount of wiring required for connections. *General Electric Co, Schenectady, N. Y.*

## Seamless Plastic Tubing

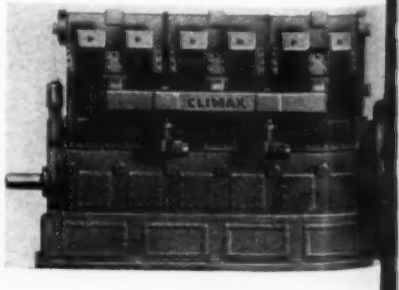
"TULOX" TT SEAMLESS PLASTIC TUBING available in all diameters up to 2 in outside diameter will be increased to

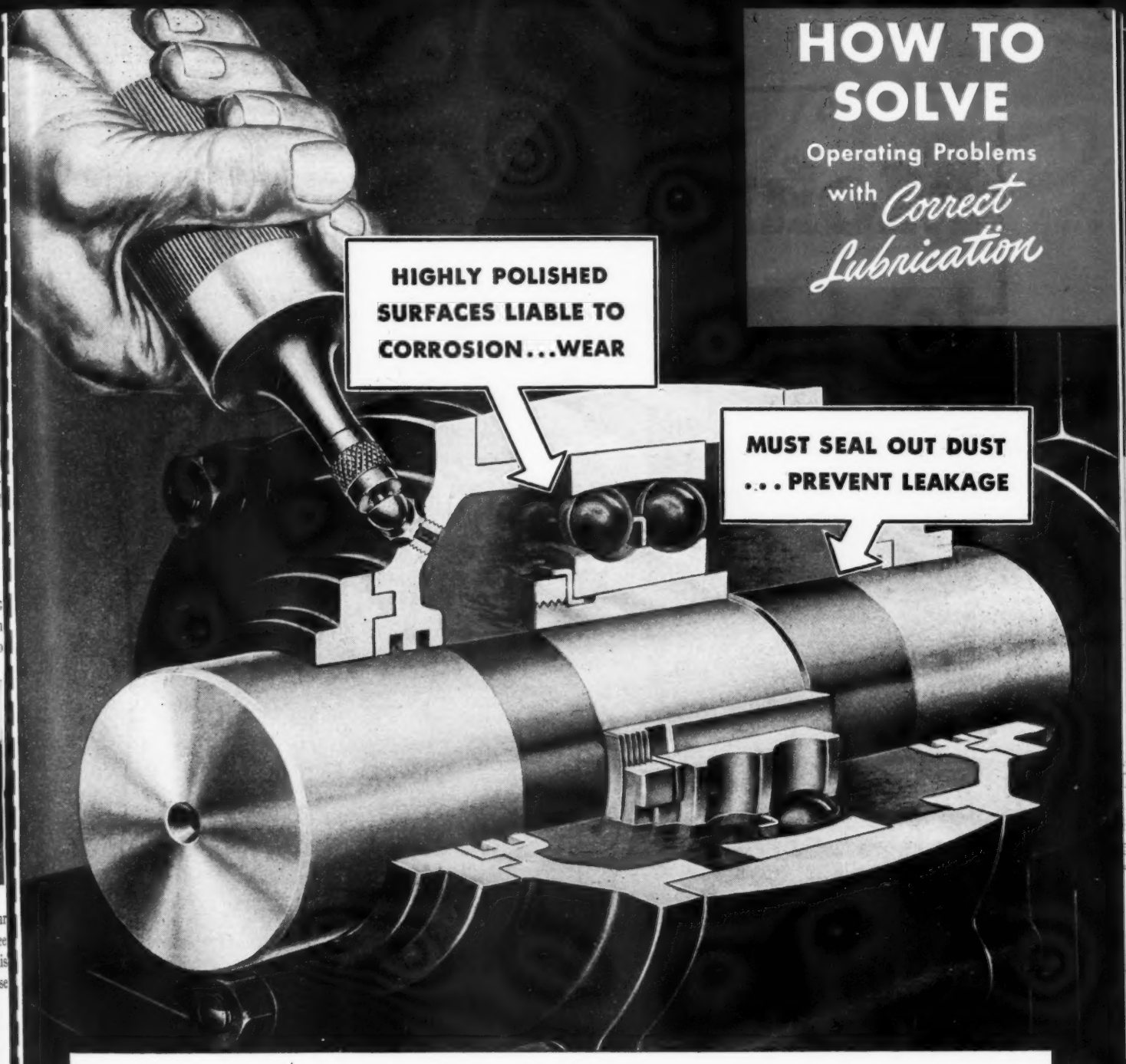


2½ OD to meet requirements of war production. Extruded from Tennessee Eastman cellulose acetate butyrate, this tubing is available from warehouse stocks. *Crane Co, Chicago, Ill.*

## High-Speed Gas Engine

V-12 BLUE STREAK engine has normal speed range of 600 to 1200 rpm and 435 bhp for oil drilling, operating large pumps and compressors, driving mining and construction machinery and, with suitable generators, a low cost means of generating electric power. Outstanding characteristics include wide fuel range, economical dual carburetion, dual ignition, high-capacity cooling sys-




HOW TO SOLVE
Operating Problems with Correct Lubrication
HIGHLY POLISHED SURFACES LIABLE TO CORROSION...WEAR
MUST SEAL OUT DUST ...PREVENT LEAKAGE

# Prevent Corrosion & Pitting

AFTER YOU'VE DECIDED to use Gargoyle BRB Greases for ball bearings you can go back to getting out production and be assured *that* problem is solved.

These greases do not break down and form the deposits which lead to corrosion and pitting.

In fact, their reliable stability allows bearings to go through periods of a year or more without repacking.

In addition, these greases do not change in structure within wide temperature ranges.

Here are greases you can *depend* on! This has been proved in thousands of applications under operating conditions.

You've solved an important operating problem when you let the Socony-Vacuum man who calls on you specify Gargoyle BRB Greases for the ball bearings in your plant.

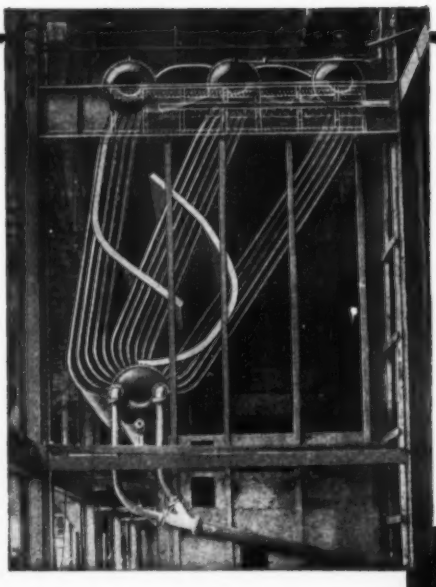
GARGOYLE Lubricants

SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.

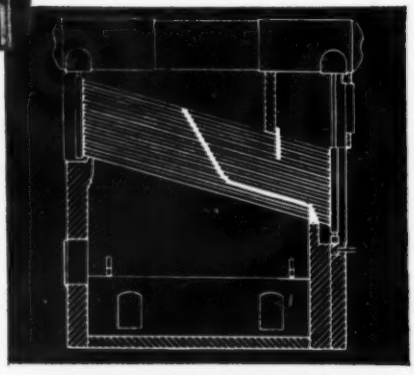
CALL IN SOCONY-VACUUM

# MORE STEAM

QUICKLY EASILY



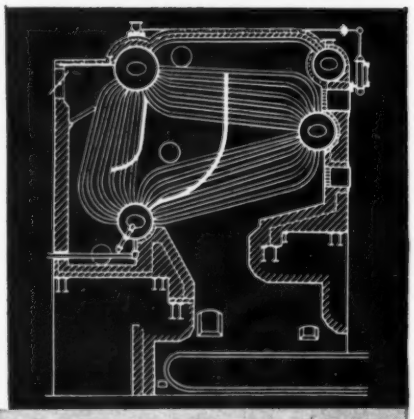
Steam output can be boosted quickly and easily by installing Enco baffles. These streamlined baffles prevent eddy currents and dead gas pockets. The cross-flow puts every square foot of heating surface to work.



Enco baffles reduce draft loss by doing away with bottlenecks in the passes. They save steam because soot blowers are more effective and used less often.

Each application is individually designed on the basis of 25 years experience with Enco baffling in all types of water-tube boilers.

Installations are made by skilled mechanics with selected materials.



FREE BOILER BAFFLES

● *A bulletin on boiler baffles gives valuable information which every engineer should have. Ask for bulletin BW 40. It's free.*

**THE ENGINEER COMPANY**

75 WEST STREET • NEW YORK, N. Y.

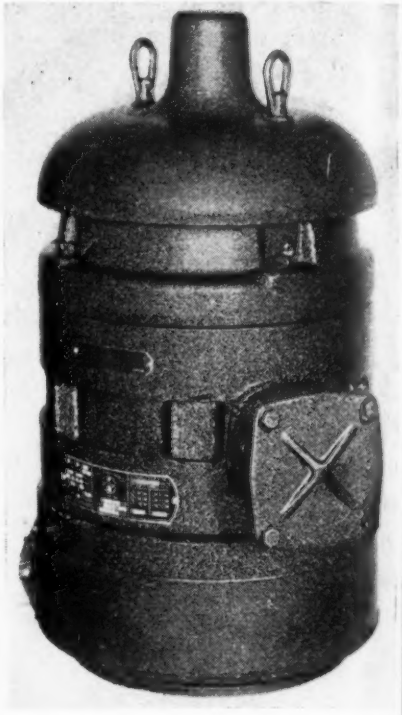
*Enco Streamline Baffles*

PRODUCED EXCLUSIVELY BY THE ENGINEER COMPANY


tem and it is claimed, infrequent and low-cost maintenance. *Climax Engrg Co, Clinton, Iowa.*

## Explosion-Proof Motors

VERTICAL HOLLOW-SHAFT EXPLOSION-proof motors offered for operation in Underwriters' Class I, Group D, hazardous gas locations. Motors designed primarily for pumps handling large quantities of volatile materials such as



high octane aviation gasoline. Special equipment is required for efficient handling of gasoline in fueling planes at each of our numerous air fields, as well as for transferring gasoline from tankers to storage location at our various outposts throughout the world. *Fairbanks, Morse & Co, 600 S Michigan Ave, Chicago, Ill.*

## Fluorescent Fixtures

MITCHELITE LINE OF FLUORESCENT FIXTURES meets all WPB and U. S. Bureau of Standards regulations, and retains every good lighting feature of past, and adds new improved features that make it more simple, more flexible, more economical to install and maintain. Lighter in weight, ruggedly built for long service, and wide range of accessories and fittings designed to save time in installing and servicing make Mitchelite readily adaptable for every conceivable method of mounting hangers, to fit every lighting situation in factories, office or drafting room. Each model can be used for both individual and continuous row

## WHAT'S MY DIESEL GOT TO DO WITH A

# GOLF BALL?

Now don't get us wrong, Sergeant Henderson. We know you're fighting muck and fatigue and Jerries and Japs for something bigger than the privilege of playing golf. *But it's freedom to work where you want, and play when you want, that the golf ball stands for.*

And that diesel unit that provides your transmitter's juice is built to fight side-by-side with you. With the same American ruggedness you have. The same brute strength to keep going, in spite of hell and high water. *But its plans for the future are different from yours.*

When the time comes for you to ease up, and enjoy life with all that a free world can give you, our engines are going to work harder than ever. Shouldering loads. Spreading electric lighting and transportation. Working long engine-weeks, so there may be shorter man-weeks.

Take our word for our part of it, Sergeant —that drop of magic called diesel engine fuel oil is going to help make the world of tomorrow a world worth fighting for. Rogers Diesel and Aircraft Corporation, 1120 Leggett Avenue, New York, N.Y. *Divisions:* Hill Diesel Engine Company; The Edwards Company; Edwards Aircraft Products, Inc.; Ideal Power Lawn Mower Co.

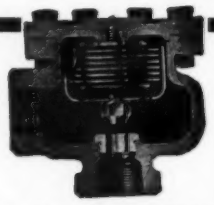
# ROGERS DIESEL AND AIRCRAFT CORPORATION

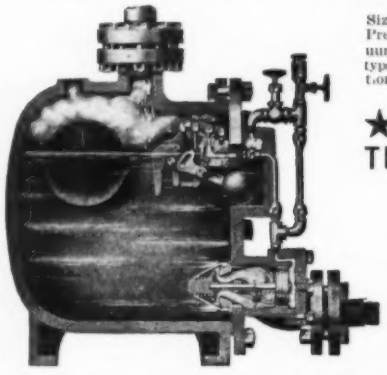
Diesel Engines, 5 to 2000 h.p. » Gasoline Engines » Generator Sets » Generators » Power Units » Switchboards
Pumping Units » Hydraulic Aircraft Equipment » Recoil Mechanisms » Power Mowers » Power Brushes
Snow Removal Equipment » Streamlined deluxe Railway Motor Trains » Diesel Locomotives

TRADE MARK REG.

**It Takes a Trap with Guts to Stand the Gaff of America's Round-the-Clock War Production**

Nicholson Thermostatic Type Industrial Traps Provide Large Capacity . . . Long Life . . . 100% Efficiency.





Sizes ¼" to 2" . . . Pressures from vacuum to 300 lbs . . . types for all applications.

★ SPECIALLY DESIGNED TRAPS FOR SUPERHEATED STEAM SERVICE

For dependable efficiency and economical durability, Nicholson makes a complete line of high pressure traps. Weight Operated for pressures to 1500 lbs.—Piston Operated for pressures to 650 lbs. Several models, various constructions, numerous sizes—for all purposes.

CATALOG No. 941—W. H. NICHOLSON & CO., 125 OREGON ST., WILKES-BARRE, PA.

**NICHOLSON Traps**

THERMOSTATIC ▼ PISTON AND WEIGHT-OPERATED STEAM GASOLINE AND COMPRESSED AIR TRAPS

CONTROL VALVES ▼ FLOATS ▼ MANDRELS ▼ STEAM AND AIR SEPARATORS



**MINIMUM CRITICAL MATERIALS . . . in this COAL HANDLING SYSTEM!**

*Shown above is one typical arrangement of the units in this B-B Coal Handling System.*

*Write us today for complete details.*

**Designed to fill today's needs for handling coal in either new installations or oil-coal conversion, this system offers numerous advantages. Send for full information.**

**BEAUMONT BIRCH COMPANY**

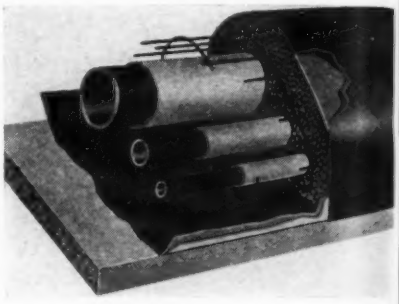
1505 RACE STREET PHILADELPHIA, PA.

MANUFACTURERS AND ERECTORS OF COMPLETE COAL AND ASH HANDLING SYSTEMS


lighting, for surface or suspension mounting. *Mitchell Mfg Co, 2525 N Clybourn Ave, Chicago, Ill.*

## Underground Pipeline Insulation

"Z" CRETE SYSTEM OF INSULATING UNDERGROUND PIPELINES with Zonolite concrete offers following advantages: Creates continuous unbroken covering of insulation around pipes, forms solid



covering of water-repellent insulation, provides highly efficient insulating material of a permanent nature, minimizes danger of damage to insulation, and greatly simplifies problem of installing and insulating underground pipelines. *Universal Zonolite Insulation Co, 135 S La Salle St, Chicago, Ill.*

## Midwest Conference

(*Continued from page* 103)

will fail from overheating if dirty inside. The final steam temperature, and pressure drop across the superheater, will indicate internal fouling. Protect the superheater when firing up or taking the boiler off the line. Don't let feed temperature fall much below 210 F.

### *Tips on Fuels and Firing*

Discussing the "Effect of Coal Sizing on Efficiency and Operation of Mechanical Stokers," Otto de Lorenzi, Combustion Engineering Co, cited many cases where limited capacity was corrected by merely sizing the coal to get a better ratio of lumps to fines. Segregation, too, should be avoided. For example, overhead bunkers and non-segregating down spouts are better than filling stoker hoppers by shovel.

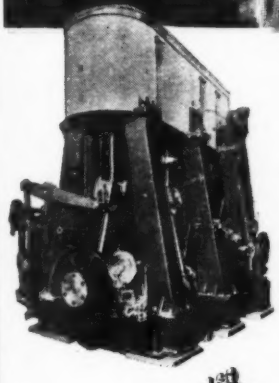
Strongly caking coals perform better when the percentage of lumps is relatively high. On the other hand, many large lumps fed through a spreader stoker may not be consumed. Mr Lorenzi concluded his talk with a color movie of actual combustion inside the furnace with different fuels.

# HENDY *POWER* for the Bridge-of-Ships

Spanning the oceans between production and fighting fronts are mighty flotillas of Liberty Ships . . . the floating bridges for men and munitions...now mass produced on a scale formerly believed impossible.

*More than one-third* of these vessels are powered with dependable Hendy steam engines . . . the same type of Hendy power plants that carried Yanks to France in 1918. Today, however, the Iron Men of Hendy turn out as many engines in 11 days as they built in two years of World War I.

If Joshua Hendy could see what has been accomplished since 1856 . . . how the Hendy nameplate has become the distinguishing mark of dependable POWER . . . if he could look over the shoulders of Hendy engineers and see their plans for the future . . . he would take justifiable pride in his vision that POWER wins wars and insures peace.



THE IRON MEN OF **HENDY** . . .

. . . now, for the first time in history, build marine steam engines by mass production, assembly line methods. These engines stand two-and-one-half stories high and weigh 274,000 pounds.

## JOSHUA HENDY IRON WORKS

HOME OFFICE

*Sunnyvale, California*

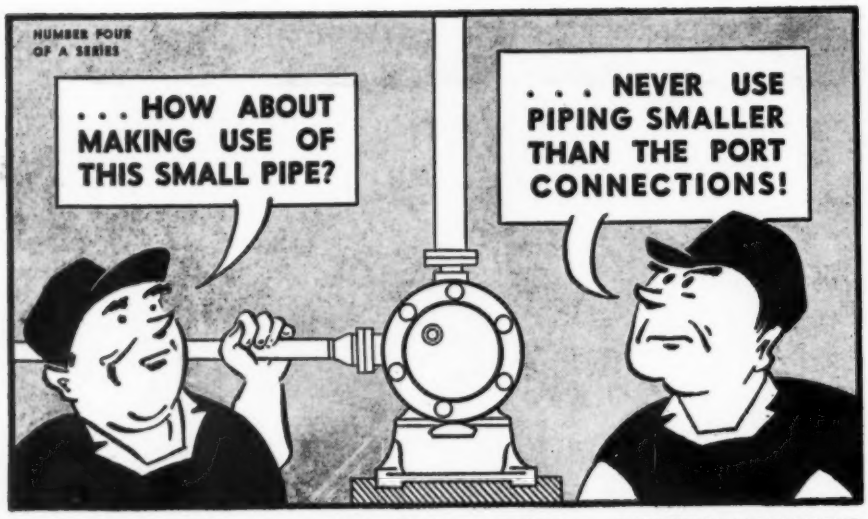
ESTABLISHED 1856

DIVISIONS: *Crocker-Wheeler Electric Manufacturing Company; Pomona Pump Company*

HENDY

MANUFACTURING PLANTS: SUNNYVALE, LONG BEACH, POMONA AND TORRANCE, CALIFORNIA; AMPERE, NEW JERSEY; ST. LOUIS, MISSOURI

BRANCH OFFICES: NEW YORK, WASHINGTON, PHILADELPHIA, PITTSBURGH, CHICAGO, ST. LOUIS, SAN FRANCISCO, LOS ANGELES




**How To Get The Most Work Out Of Your VIKING PUMPS**

Use of pipe of the proper size for suction and discharge lines is essential to the efficient operation of Viking Rotary Pumps. Do not use pipes smaller than the connections on the pump. The next larger size is preferable, especially on heavier oils or on suction lines exceeding 100 feet. If suction lines required are longer than 200 feet, write for special recommendations.

Now that pumps are hard to get it pays to take good care of the ones you have. The Viking Service Manual tells you how. It gives you clear, practical help in mounting, operating and maintaining Viking Rotary Pumps.

Write today for your copy of the Viking Service Manual. It's free and will be sent by return mail.

VIKING PUMPS — FIRST IN AMERICA

**VIKING Pump COMPANY**
CEDAR FALLS, IOWA

• SAFETY & RELIEF VALVES • PRESSURE & VACUUM GAUGES • SPECIALTIES •

*Use* This Lonergan Model "WTN" top-guided relief valve where *high lift* and *high discharge capacity* are necessary. "WTN" is more than just one valve—it is a whole series of related designs and constructions for steam, air, gases, or liquid service. . . . Lonergan engineers are resourceful "problem-solvers", and have one of the most complete lines of Safety and Relief Valves on which to base their recommendations. Submit your problem.

**J. E. LONERGAN COMPANY**
RACE & SECOND STS.,
PHILADELPHIA, PA.

Lonergan

*SIGN OF PROGRESSIVE ENGINEERING!*

SINCE 1872

• SAFETY & RELIEF VALVES • PRESSURE & VACUUM GAUGES • SPECIALTIES •


B V E Nordberg, Nordberg Manufacturing Co, listed recent improvements in heavy-duty diesel engines. Combustion is better, parts lighter and speed higher. Today's engines take much less space, are more easily moved and serviced, yet cylinder dimensions have not been reduced.

Mr Nordberg called attention to the gas-burning diesel which can be quickly shifted from gas to oil or vice versa. This engine is well adapted for the use of sewage gas from sewage-disposal plants.

Supercharging has revived the 4-cycle engine as a serious competitor of the 2-cycle. It also places the small and medium-speed engine nearer the heavy-duty field, Mr Nordberg concluded.

Much valuable data was presented by L E Hebl and L W Griffith of Shell Oil Co in a paper "Effect of Fuel Composition on Deposition in Diesel Engines."

### *Jobs Ahead for Designers*

At least two papers dealt specifically with design. In his paper "Conservation in Design of Power Stations," F H Hollister, chief electrical engineer of Sargent and Lundy, Chicago, said that many of the savings found possible today will be carried over into post-war designs. Today, he said, we are designing most plants with a dividing wall between turbine and boiler room. Recently walls have been omitted between the turbine room, and control and switchgear room in several plants. Other steel savings are made by the extensive use of concrete and wood and by more economical factors for boilers, valves and condensers, etc.

Turning from plants to equipment, R B Smith, Director of Engineering Research, Elliott Company, discussed "Engineering Economics of Product Design." In certain units efficiency pays big dividends. For example, each 1% increase in the efficiency of a 5000-kw turbine would warrant a $5000 bonus on the following assumptions: Annual load factor 45%; station heat rate 17,100 Btu per kwhr; first cost of turbine alone $72,500; coal $4.50 per ton.

Mr Smith then discussed in detail the problems of blower design, concluding that substantial improvements in efficiency are possible and commercially justifiable.

### *Other Papers*

"Use of Automatic Control to Increase Plant Capacity," H H Gorrie, Bailey Meter Company, is abstracted at length on page 90 of this issue. Space is lacking to review other excellent Conference papers of less immediate interest to the power engineer.

# Can the oil in your turbines match this performance?

**IOWA POWER & LIGHT CO.**
Des Moines, Iowa

| | |
|---|---|
| Type of Turbine— | 35,000 kw. generator |
| Placed in Service— | November 25, 1938 |
| Original filling— | 4,400 gals. |
| Make-up oil— | 300 gals. |
| Steam temperature— | 925° F. |
| Steam Pressure— | 1,290 lbs. per sq. in. |

Sample taken from system on February 22, 1943 (after 30,096 hours of continuous operation), analyzed and certified by competent testing laboratories, showed no significant oxidation or change in color. See photos and analyses at right!

**Certified Proof of the Superior OXIDATION STABILITY of Shell Turbo Oil**

| | | |
|---|---|---|
| Color—N P A | 1— | 1½+ |
| Appearance | Clear | Clear |
| Water | None | None |
| Say. Univ. Vis. @ 100° F. | 156 | 159 |
| Neutralization No. | 0.05 | 0.05 |
| Saponification No. | 0.1 | 0.1 |
| S. E. Number | 90 | 240 |

For further details on this and other outstanding performances of Shell Turbo Oil call in the Shell man. Or, write Shell Oil Co., Inc., Dept. "A," 50 W. 50th St., New York, N. Y., or 100 Bush St., San Francisco, Cal.

**SHELL TURBO OIL**

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Currently, the U. S. Navy has first call on Shell's entire production of marine turbine oil

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# INVOLUTE SPRAY NOZZLES

Unique Yarway Involute design.

No internal parts or vanes to clog or erode.

Unobstructed flow gives minimum loss of head.

Finely divided spray cone provides rapid cooling.

Renewable orifices adapt nozzles for any service.

Installations total more than 5 million gallons per minute in water cooling and air conditioning service.

Made in both cast and bar-stock types. All sizes from ¼ in. to 2½ in. Write for Catalog N-616.

**YARNALL-WARING COMPANY**
100 Mermaid Ave. Philadelphia

## Power Lines

(*Continued from page* 132)

with an area of 50 square in., or more. This scrap is divided into long and short pieces, for use in production of a large number of various small parts. During a recent six-week period, **40,000 lb of such sorted scrap** were so used, and it is estimated that **800,000 lb of material** will be saved annually in just this one division.

**Diesel engineers** will want to remember the date of **June 14-16**—that's when the **Oil & Gas Power Division, ASME,** will hold its Sixteenth National Conference at the **Lord Baltimore Hotel, Baltimore, Md.** No program has yet been released, but present plans indicate that technical sessions will include papers of timely interest . . . Twelve technical committees will report and 28 papers will be presented at the **34th annual meeting** of the **National District Heating Association,** to be held at Hotel Schenley, Pittsburgh, Pa., June 9 and 10. . . . **The American Standards Association** announced election of four new members to its board of directors, **J T Barron,** Public Service Electric & Gas Co; **C A Gill,** Reading Co; **Robert G Griswold,** Electric Advisers, Inc.; **Alvah Small,** Underwriters' Laboratories, Inc.

Requests for congressional investigation into the **de-rating of public power** projects in the Northwest where top priorities are assigned private companies was recently placed before the House Rules Committee. The request was introduced by **Rep. John M Coffee,** Washington. Resolution provides for a committee of five senators and five representatives, to conduct a study of the securing of equipment facilities for furnishing electric power for war or defense purposes. Primarily under attack is the WPB action last summer which de-rated three generators and turbines scheduled for installation at **Grand Coulee** and up-rated equipment for the Aluminum Co's vast new **Shipshaw** development. The resolution authorizes **$20,000 for committee expenses,** which is not generally regarded as sufficient to make any worthwhile survey of the field.

A substantial **boost in aluminum output** to meet nation's vast requirements was reflected in a recent report from **Cooper-Bessemer Corp.** They supplied


"Ring of Distinction"

# Install FRANCE Metal Packing for "Round-the-Clock" PRODUCTION

The renewal of ordinary packing every few weeks or months increases horsepower and production costs.
Minimum friction is encountered with France Metal "Ring of Distinction" Packing. No undue force can be exerted on rods or stems by tightening the stuffing box stud nuts. The rings are free to float in the case that retains them and are held to the rod or stem with a garter spring having minimum tension.
The result is tight "full-floating", trouble-free performance for years. Prompt delivery assured.

**FREE**

44-page Catalog of useful and valuable information. Write for your free copy of Catalog M-7, with facts on

- Packing Designs for Any Service
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- Pressures and Temperatures
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Request France Engineers to analyze your packing requirements. There is a representative close at hand.

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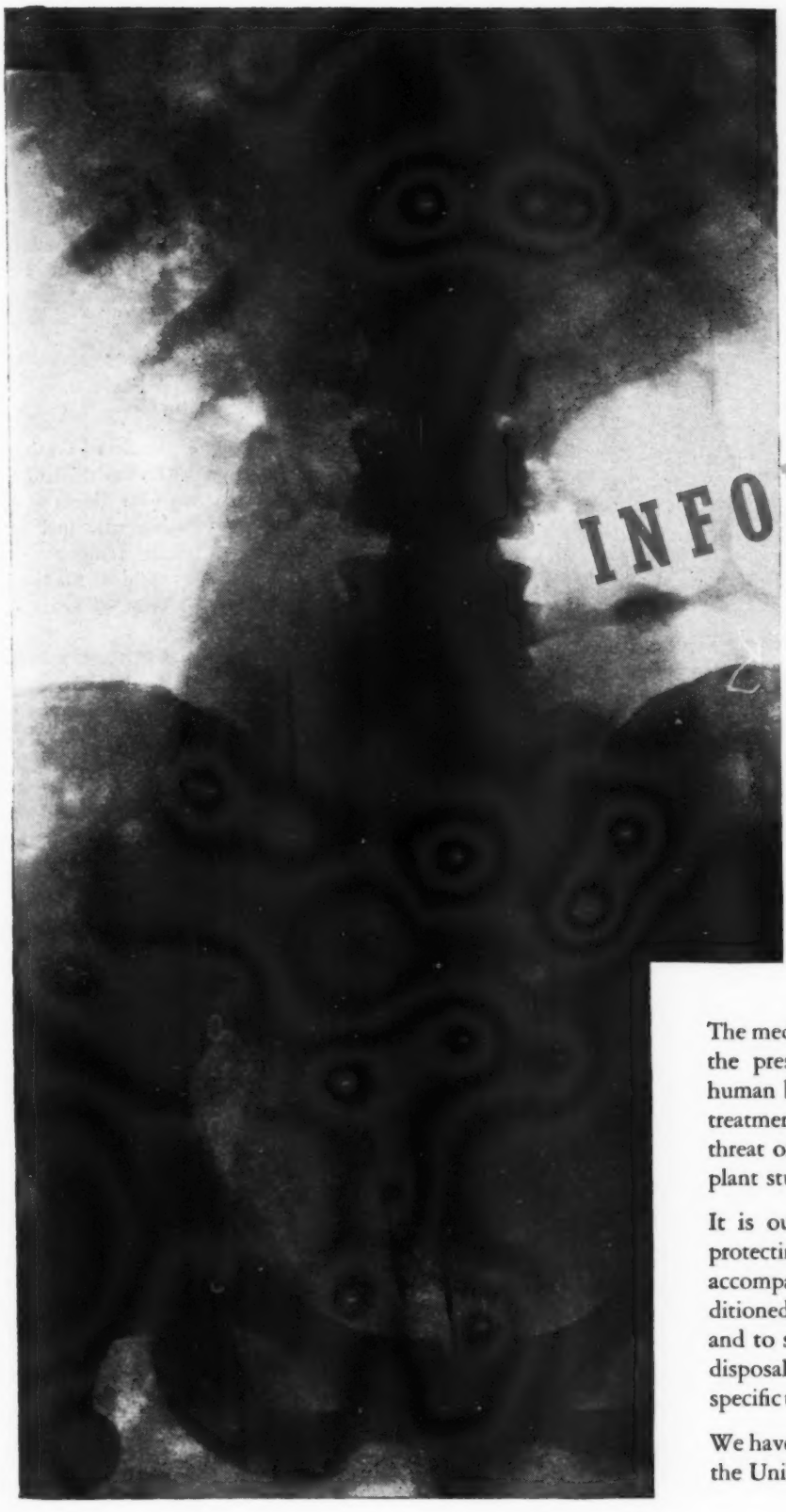
*Original* FRANCE METAL PACKING




The medical doctor can detect, by means of the X-Ray, the presence of a dangerous condition within the human body. Similarly, in the field of industrial water treatment the Betz organization can determine the threat or existence of a dangerous condition, through plant study and laboratory analyses.

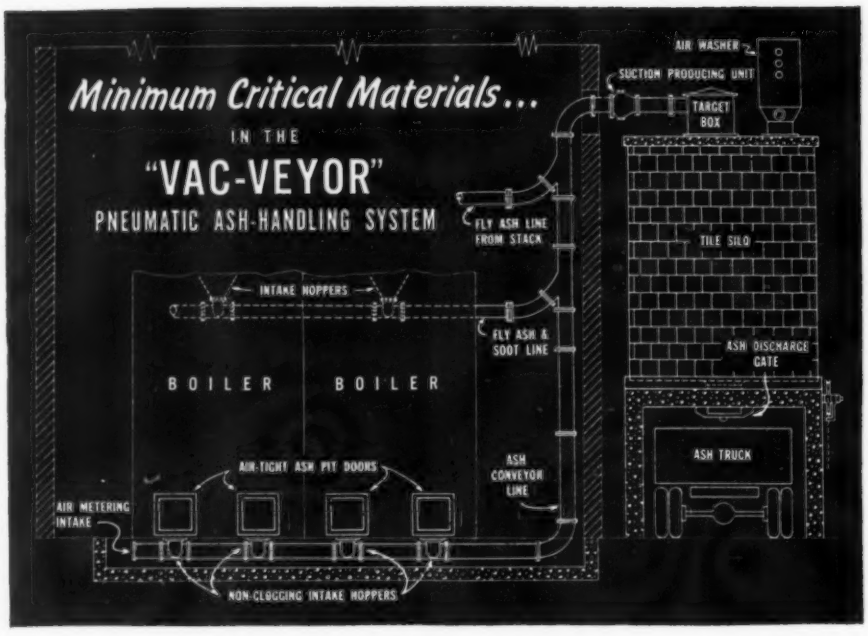
It is our function to assume the responsibility for protecting industry from the many hazards which accompany the use of incorrectly or inadequately conditioned water for boiler, cooling, and process uses—and to solve problems of industrial waste and sewage disposal. Our service is complete for all industries, with specific treatment recommended for each individual case.

We have laboratories and engineers located throughout the United States and Canada.

**W. H. & L. D. BETZ**

**FRANKFORD • PHILADELPHIA • PENNA.**

**CHEMICAL ENGINEERS AND CONSULTANTS ON ALL WATER PROBLEMS**

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**Designed to fill today's needs in either new installations or oil-coal conversion, this pneumatic ash handling system offers numerous advantages.**

**BEAUMONT BIRCH COMPANY**
1505 RACE STREET PHILADELPHIA, PA.

MANUFACTURERS AND ERECTORS OF COMPLETE COAL AND ASH HANDLING SYSTEMS

# THE BURNING-END *THAT ENDS MANY COMMON STOKER TROUBLES*

***—one of several important new features engineered by FREDERICK!***

Frederick Stokers have *more active grate surface,* without dead plates . . . whether furnished with or without side dumping grates.

The specially designed tuyeres have air ports so arranged and proportioned as to insure complete air distribution and maximum combustion efficiency.

And, the wind-box is enclosed to simplify and make a neater installation, and to eliminate efficiency loss through leaky brickwork. *Two* cleanout doors are provided to allow thorough cleaning *both sides* of the grate area.

*Yes, the new Frederick Stokers are DIFFERENT! A long list of original features distinguish them. Many common stoker problems are solved by them. And, if you're looking for maximum thrift, convenience and efficiency, we suggest you investigate.*

All details upon request; no obligation.

# FREDERICK STOKERS

**THE FREDERICK IRON & STEEL COMPANY • FREDERICK, MD.**

COMPLETE LINE OF CENTRIFUGAL PUMPS FOR ALL PURPOSES
STEAM OPERATED ASH CONVEYING SYSTEMS • ASH STORAGE BINS


a large battery of natural-gas engines to generate electric power for a huge new aluminum plant. **Production** on this job was **stepped up** nearly 50%. . . . **Maxim Silencer Co** and its employees received a telegram of appreciation from **E L Cochrane, chief of Bureau of Ships,** citing performance of their equipment, which effectively silences engine exhaust on important naval fighting craft.

✪ ✪ ✪

### Obituaries

**Max W Babb,** chairman of the board of **Allis-Chalmers Mfg Co,** died March 13 in Milwaukee after an illness of several weeks. Mr Babb, who had been board chairman since January, 1942 and the company's president for the ten years prior to that, was 68 years old.

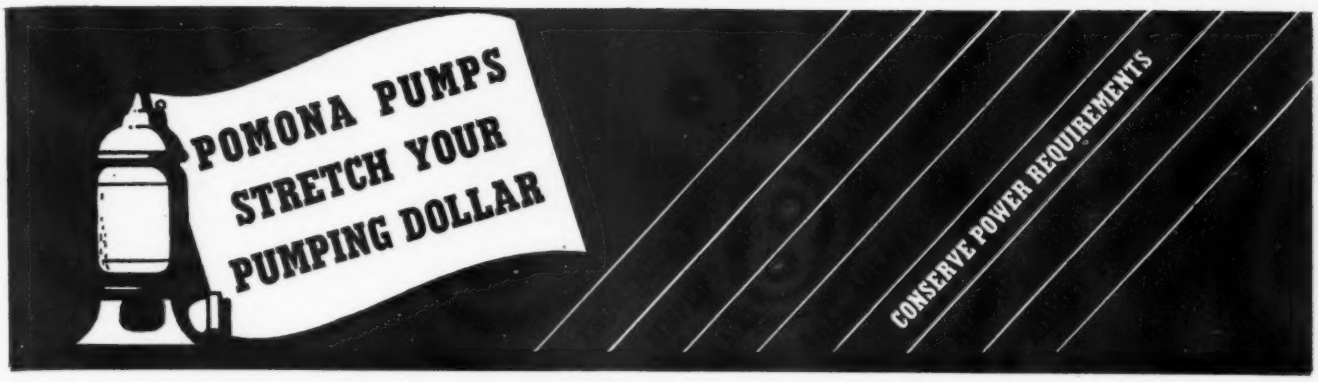
Assistant vice president and manager of agencies for the **Ric-Wil Co, James T Machen,** 34, died of heart failure while attending a sales meeting on March 31.

**Lewis P Gove,** 51, resident engineer for **Mutual Boiler Insurance Co,** in the New York office, died suddenly at Beacon, N. Y., March 6, after completion of an inspection task in an industrial steam plant. He joined the Mutual Boiler Co as chief inspector in 1936 and was transferred to the New York office on January 1 last.

Vice president of the **New England Power Co, Francis J Buckley,** died March 19 at his Boston home, at the age of 53.

**Harry Herbert De Loss,** director of **Handy & Harman, New York,** passed away March 28 at Clearwater, Fla. He joined this organization, which he served in many capacities, in 1900 when the Standard Metal Co of Chicago was absorbed by Handy & Harman. Mr De Loss served in capacity of vice-president for many years; he was treasurer from 1905 to 1915, and a director from 1905 until his death.

One of the founders of **Everlasting Valve Co, Wm F Madill,** 65, died recently at his residence in Nutley, N. J. For 28 years assistant manager of sales for the **Allis-Chalmers** Norwood, Ohio Works, **Ralph O Gooding,** 62, died March 3. **John G Barry,** honorary vice president of **General Electric Co,** died at his home in Schenectady, March 4, after a long illness at the age of 75. Chief engineer of the **Century Electric**




# NEVER BEFORE HAS POWER CONSERVATION BEEN SO IMPORTANT

*Never before have Pomona advantages been so vital!*

**Pomona Pumps are singularly able to cut power requirements to a minimum because they embody basic engineering advantages found in no other pumps . . .**

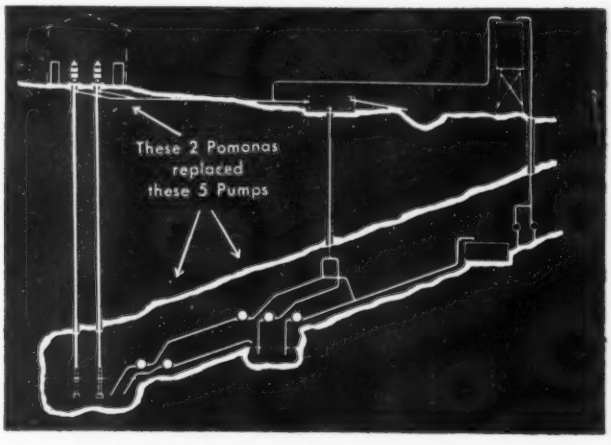
**BULBOUS VANED BOWLS!** This outstanding Pomona Pump development has lifted the already high Pomona efficiencies to a new peak . . . *in some cases above 90%* . . . reducing power requirements to a record low. The bulbous end shape smooths out fluid flow, minimizing turbulence, eddy currents and resultant skin friction. Result — more power goes into actual water pumping!

Bulbous vaned bowls are a recent Pomona advancement, and older Pomona Pumps can be re-bowled with this power-conserving feature. However, to save metals, get as much service as possible from your present bowl assemblies before having them changed for the new bulbous-vaned type!

**ADJUSTMENT FOR CAPACITY!** Here's another vital power-conserving feature that no other pump provides—ability to adjust the capacity to your exact needs *without wasteful throttling.* Unlike conventional pump impellers, Pomona's semi-open impellers can be raised or lowered on their seats to give the exact flow desired, *with proportionate savings in power.* And this adjustment can be quickly made *at the surface* with minimum effort. Raising the impeller gives more clearance between blades and seat—pumping less water and, at the same time, reducing the operating power required.

***RESULT—power consumption is proportionate to amount of water pumped.***

**Contrast this with the valve-throttling necessary in other type pumps to adjust pump flow. Throttling increases the pressure the pump must work against—*increases* the power required in proportion to flow.**




**ONE POMONA CAN REPLACE SEVERAL PUMPS—** Often a single Pomona Pump will do the job now requiring *several* other-type pumps . . . will do it *better,* with considerably *less* power. Typical is the Pomona installation diagrammed above where two Pomonas replaced FIVE horizontal pumps on a dewatering job. The Pomonas not only eliminated excessive piping and power cables, but did the job on 400 h.p., whereas the 5 pump arrangement had required 675 h.p.—*67% more!* Compare the power *costs*—$19,936 per year with the five-pump set-up . . . $10,750 per year—about HALF—with the Pomonas!

Call in your nearest Pomona representative and have him check over your pumping installation. Perhaps he can help you take fuller advantage of the *many* — and varied — savings incorporated in Pomona Pumps. You'll save power, save money, save maintenance . . . *and save resources vital to our war production!*

**POMONA**
*Water-Lubricated*
**PUMPS**

**JOSHUA HENDY IRON WORKS**
POMONA PUMP CO. DIVISION
120 BROADWAY, NEW YORK CITY
**Plants:** 4301 So. Spring Ave., St. Louis, Mo.
206 Commercial Street, Pomona, California

**An executive of WPB recently said "Materials will be so short that we will have to *patch* and *pray* to keep our machinery going."**

**When you use SMOOTH-ON No. 1 to do your machinery "patching", you need not "pray" for successful results. For 48 years, plant maintenance men and mechanics have found that SMOOTH-ON makes results SURE when you use it to seal cracks in machinery castings, to stop leaks in apparatus and on pipe lines, and to tighten loose fixtures of machinery and structures.**

**Today, more than ever before, SMOOTH-ON is a plant necessity . . . to "keep machinery going", and thereby prevent production delays during the war period when replacements are difficult or impossible.**

*Get Smooth-On No. 1 in 7-oz., 1-lb., 5-lb., or 25-lb. containers from your dealer, or if necessary from us. For your protection, insist on* SMOOTH-ON, *used by engineers and repair men since 1895.*

**FREE**

**40-Page Handbook**

**Simple, concise instructions for hundreds of material-saving repairs to plant equipment and pipe lines are given in this 40-page practical repair manual. A war-time necessity in every plant. Your copy sent FREE, if you fill in and return the coupon.**

**SMOOTH-ON MFG. CO., Dept. 30**
**570 Communipaw Ave., Jersey City, N. J.**
Please send SMOOTH-ON HANDBOOK.

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5-43

**Do it with SMOOTH-ON**


**Co,** St Louis, Mo., **Martin Schiff,** 53, died suddenly on February 15.

**Wm H Barnard,** 84, chief steam plant engineer of the Salem (Mass.) Electric Lighting Co, from 1889 to 1920, died in Salem on March 1. One of the best-known steam turbine engineers in the country, **Arthur C Flory,** 60, died March 1 at his Milwaukee home after a long illness. For 24 years he had been manager of the Steam Turbine Dept of **Allis-Chalmers Mfg Co. George E Leavitt,** 75, superintendent and chief engineer of **Merrimac Valley Power & Building Co,** died at Amesbury, Mass., on March 25.

**J W Gardner,** 80, associated with **Gardner-Denver Co** from 1881 until ill health forced him to withdraw from active participation in business several years ago, died February 1. During his period of active management, he was president, chairman of the board and chairman of the executive committee. Mr Gardner was past president of several national associations and societies including The National Foundry Men's Assn, The National Metal Trades Assn, The National Compressed Air Society and The National Hydraulic Society.

**Arthur L Kimball,** research physicist and consulting engineer of the **General Electric Co,** died suddenly March 20 at his home in Schenectady of a heart attack. Mr Kimball, who was 57 years old, had been associated with General Electric for 25 years.

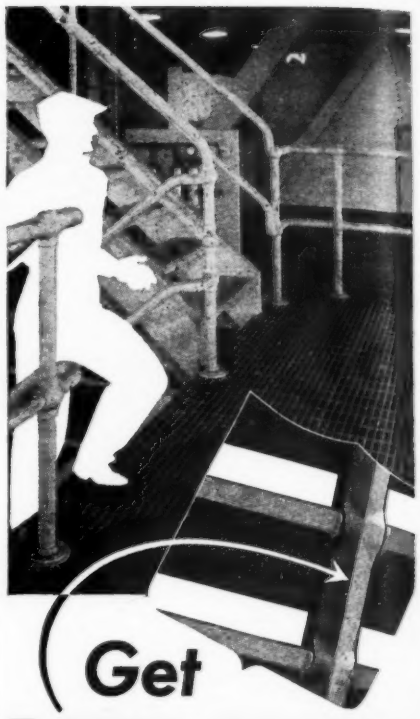
o o o

**Foster Wheeler Corp:** White-star award presented Dansville works recently.

**Pittsburgh Steel Co:** Award presented Allenport and Monessen plants March 18.

**Solar Mfg Co:** Award presented early in April.

**General Electric Co:** Award presented Bridgeport works March 26.

**Get BATES-GRATES FOR YOUR OPEN STEEL FLOORING AND YOUR FLOORS, TOO, WILL BE CLEANER AND SAFER**

See that scraper tread—and the crisp lines of the Hex cross bar? *That* gives a safer and cleaner tread and at the bottom of those cross bars you find clean, well-shaped fillets made by the metal displaced in the Bates patented process—no metal is lost. The weld is cleaner and stronger. The *floor* is cleaner and stronger. Yet, open steel flooring made under Bates patents costs no more.

*Write for 8½ x 11 booklet that explains all details and shows many fine installations.*

**WALTER BATES COMPANY, INC.**
**JOLIET, ILLINOIS**
*OPEN STEEL FLOORING • STAIR TREADS*

# engine efficiency down?

*check your exhaust piping**

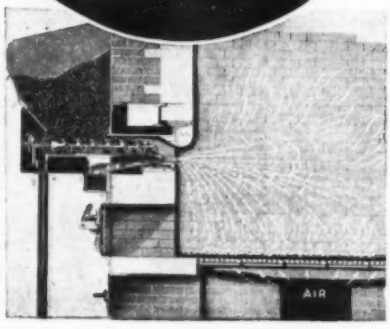
* Loss of engine efficiency, excessive back pressure, unnecessarily noisy operation, can often be traced directly to improper exhaust piping. It will pay you to check with the Maxim Engineering Dept. Whether or not you have or can buy silencers today, Maxim's wartime engineering service is yours for the asking. Simply give full details and write to The Maxim Silencer Co., 92 Homestead Ave., Hartford, Connecticut.

Maxim Waste Heat Units save fuel. Bulletins WH-100 and WH-103 on request.

# MAXIM

WARTIME ENGINEERING SERVICE

Change over NOW— Oil to Coal!



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MULTIPLE SPREADER STOKERS

FYR-FEEDERS meet *every* wartime firing problem. Every Fyr-Feeder feature is a direct aid to today's situation. No other method of firing can offer all these advantages:

**BURNS COAL LIKE OIL**—Fyr-Feeders burn fines in suspension; spread coal over entire fuel bed, burning larger pieces on grate.

**USES ANY COAL**—Local coals, cheap coals, screenings or sweepings.

**SAVES LABOR, EASY TO OPERATE**—Anyone can operate a Fyr-Feeder.

**INCREASES BOILER CAPACITY**—And produces steam quicker.

**SAVES MONEY**—Helps meet higher costs and taxes.

WRITE FOR CATALOG

*Many other Fyr-Feeder advantages described in new catalog. Take the right step toward conversion today —WRITE.*

**AMERICAN COAL BURNER CO.**

*Engineers, Est. 1918*

**32-18 E. Erie St. Chicago, Ill.**

*General Electric Co: Maritime "M" and Victory Fleet flags awarded Erie plant March 19.*

**American Foundry Equipment Co:** Award presented April 16.

**De Laval Steam Turbine Co:** White-star award presented recently.

*Jenkins Bros: Maritime "M" award presented Bridgeport plant March 2, and white-star award March 9.*

**Scovill Mfg Co:** White-star award presented recently.

**Worthington Pump & Machy Corp:** Award presented Buffalo works March 19.

*Edward Valve & Mfg Co: Maritime "M" pennant, Victory Fleet flag and Labor Merit badges were presented March 13.*

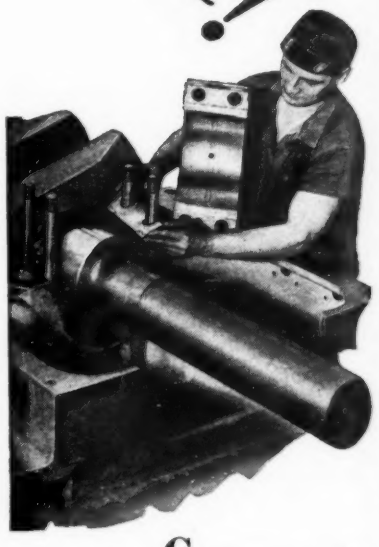
---

**Charles Belknap,** chairman of the executive committee and executive vice-president of **Monsanto Chemical Co,** was recently elected president. . . . **McClave Co,** of Allentown, Pa., announces appointment of a Mississippi division manager, W C Christensen. . . . **Dr Charles M Slack,** research physicist, has been made assistant director of research at **Westinghouse Lamp Division,** Bloomfield, N. J. . . . Stockholders of **Detroit Edison Co** re-elected **Wesson Seyburn** and **Silas A Strickland** as directors. **James W Parker** was elected vice-president and general manager.

Nearly 40 representatives of **public and private utility systems** from all parts of the country met with **Director of War Utilities J A Krug** to discuss most practical means of putting into effect and administering a **non-essential lighting "brownout"** if such a step is decided upon as a fuel and transportation conservation measure by the Government. Questions on the agenda at this preliminary meeting included minimum show-window and identification lighting, policing, etc.

**William L Batt, vice-chairman of WPB and president of SKF Industries, Inc,** Philadelphia, recently received the **Bok Award, a medal and a $10,000 check.** This award was made not only for his service to the nation in leading industrial mobilization for the war, but as the citizen who performed the most distinguished service for Philadelphia in 1942.

pressure-proof!



**CONSERVE machine efficiency!** *Babbitt-tipped* **Laminum shims, for pressure-lubricated systems, prevent oil and pressure losses. Body of shim retains all Laminum features of quick precision adjustment by** *peeling* **. . . in factory assembly or field service.**

**The .003 or .002 in. laminations are bonded into a solid unit . . . easy to peel.**

***Laminum shims are cut to your specifications. For repairs or maintenance, get stock shim materials from mill supply dealers. (Write us for illustrated shim application file-folder and Laminum sample.)***

**Laminated Shim Company**
**Incorporated**

**61 Union Street Glenbrook, Conn.**

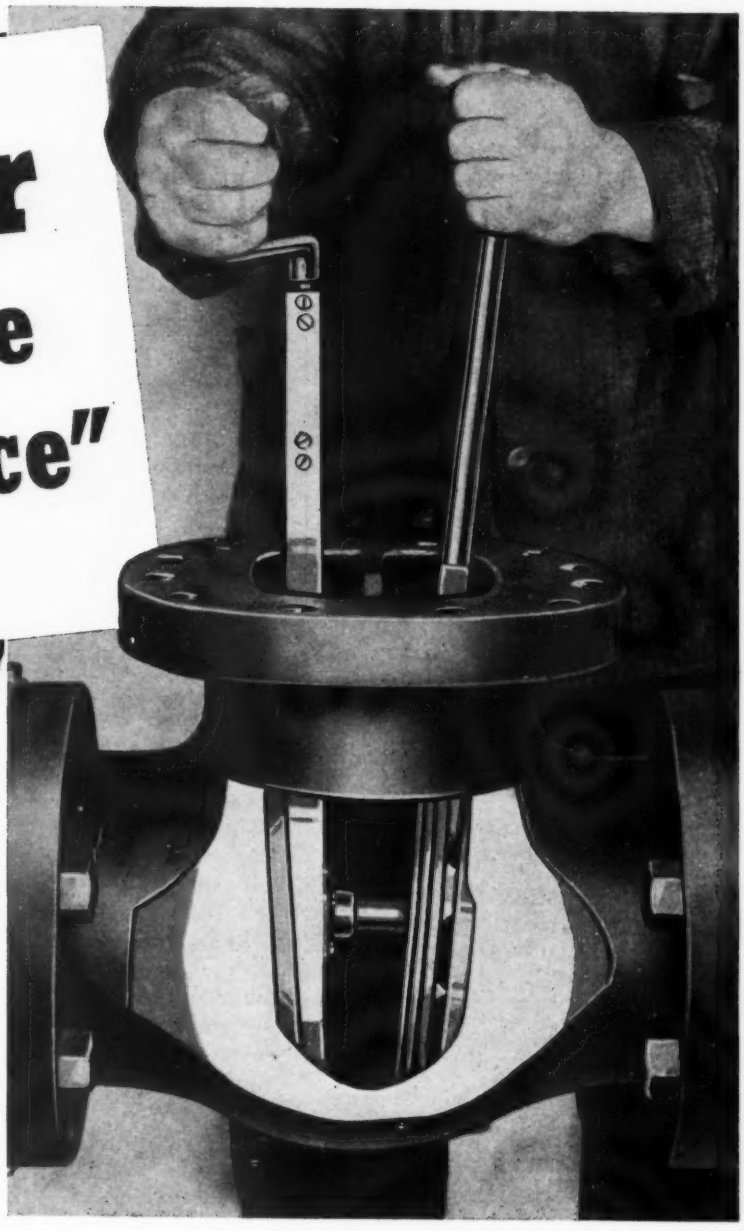
it's **LAMINUM**

THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

# Keep Your Valves in Good Working Order

WITH

# Dexter "Preventive Maintenance"



Today when new valves and parts are so difficult to obtain, protect *your* valve investment with Dexter Valve Reseating Equipment.

With Dexter equipment, any mechanic can quickly and economically reseat any make of gate, globe or pump valve, keeping them in good condition – pressure-tight—preventing waste and reducing costs. It makes no difference what type of metal a valve seat is made of because there are Dexter Cutters for monel, stainless steel, stellite, brass and bronze.

Dexter "Preventive Maintenance" for valves will help you achieve and maintain maximum production. Write for further information about Dexter Equipment today.

**Use**

## DEXTER

**Valve Reseating Equipment**

**THE LEAVITT MACHINE CO., 105 EAST RIVER ST., ORANGE, MASS.**

Prevent RUST SCALE DIRT From Clogging Steam Equipment

YARWAY STRAINERS

"The Screen's the Thing"

- *A High Grade Monel Woven Wire Basket* with mesh fine enough to catch the dirt—yet ample free area for passage of clean condensate, oil and other fluids.
- *Body Cadmium Plated Inside and Out for Protection Against Corrosion.*
- *Readily Removed Steel Blow-Off Bushing.*
- *Bushing Automatically Aligns Screen.*
- *Thousands in Use—Sold by Over 100 Mill Supply Houses.*
- *6 Sizes ½" to 2" for Pressures up to 600 Lbs.*

*See Your Supply House or write for Bulletin S-200*

YARNALL-WARING COMPANY
100 Mermaid Ave. PHILADELPHIA

**Allis-Chalmers Mfg Co** announce the appointment of **Robert C Allen** as manager of their steam turbine department, succeeding the late Arthur C Flory. . . . **Robert H Morse, Jr,** has been appointed general sales manager of **Fairbanks, Morse & Co.** . . . **Cooper-Bessemer Corp** was recently cited by the National Safety Council as one of the two heavy-machine manufacturers in the country having best safety records, according to the latest survey made during Accident Rate Contest sponsored by that organization. . . . **Power Specialty Co,** Houston, Texas, announces association of **R H Knipping** with the firm as a member. He will take over the San Antonio, Austin, Corpus Christi territory which he covered some years ago.

**Proportioneers, Inc.,** recently announced election of **Rudy P Lowe** as president. Mr Lowe was formerly vice-president and chief engineer of the company. . . . The board of directors of **Wilkening Mfg Co** recently elected **Sydney P Lyon** vice-president in charge of production.

**Mechanite Metal Corp's** new headquarters are in the Pershing Bldg, New Rochelle, N. Y. . . . **James H Withers** has joined **F J Hearty & Co,** California representatives for the **Edward Valve & Mfg Co,** as a partner. . . . **Vibroscope, Inc,** will move their factory and office May 1 to 6 E 39th St, New York, N. Y. . . . **Paul Plummer** has been appointed superintendent of electrical construction and maintenance for the production department, **United Illuminating Co,** and **Richard Miller** has been designated chief system operator.

Effective effort would improve use of at least 300,000,000 tons of coal per year, according to **J F Barkley,** chief, Division of Solid Fuels Utilization for War, Bureau of Mines, in a paper entitled **"Prevent Fuel Waste for War,"** published by permission of the director, Bureau of Mines, United States Department of the Interior. Mr Barkley further states that reducing fuel consumption will relieve mines as well as transportation facilities.

**Answers to most frequently asked questions** in connection with operation of **Controlled Materials Plan** have been made available by WPB in booklet form. Questions and answers have been compiled following field surveys by the staff of the Controlled Materials Plan Division and represent an aid to industry in operating under CMP Regulations as they stand today.

*Cochrane Exhaust Steam Purifier located between 150 h. p. engine and coil of hot water generator.*

COCHRANE PURIFIERS PROTECT & IMPROVE THE EFFICIENCY OF BOILER PLANTS

*(on inlet side of prime mover)*

- by removing dirt and moisture from steam.
- by preventing slugs of water from wrecking turbines, engines and pumps.
- by making it possible to drive boilers at higher ratings.

*(on exhaust side of prime mover)*

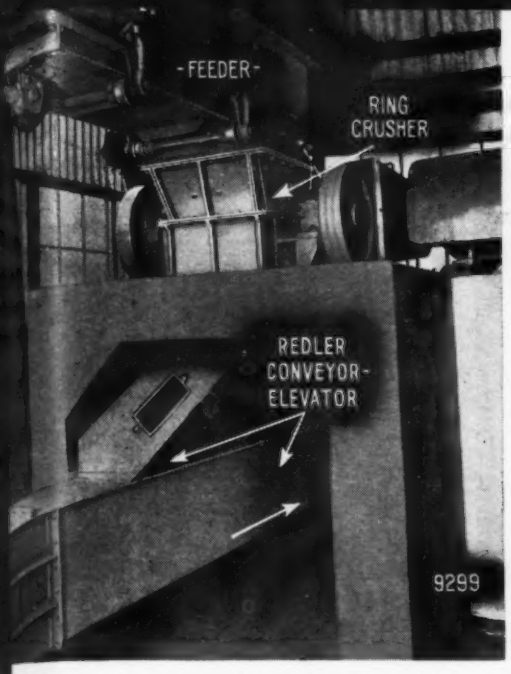
- by removing oil and water from exhaust steam, making it usable for boiler feed or process work.

*Write for Publication 2725*

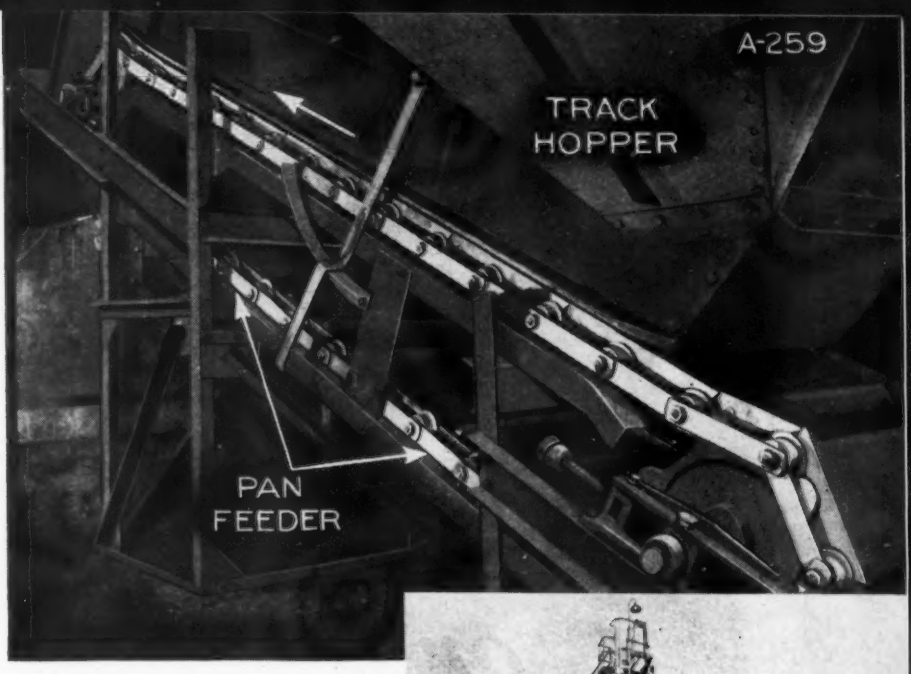
COCHRANE CORPORATION
3106 N. 17th St., Philadelphia, Pa.

COCHRANE

PURIFIERS




*S-A Knittel Crusher reduces mine-run coal to a uniform ¼" size at 50 tons per hour. A Redler elevates the sized coal to storage bins.*




*Coal from the Track Hopper is being carried by Pan Feeder to Crusher.*

# When Uncle Sam Urged Conversion to Coal

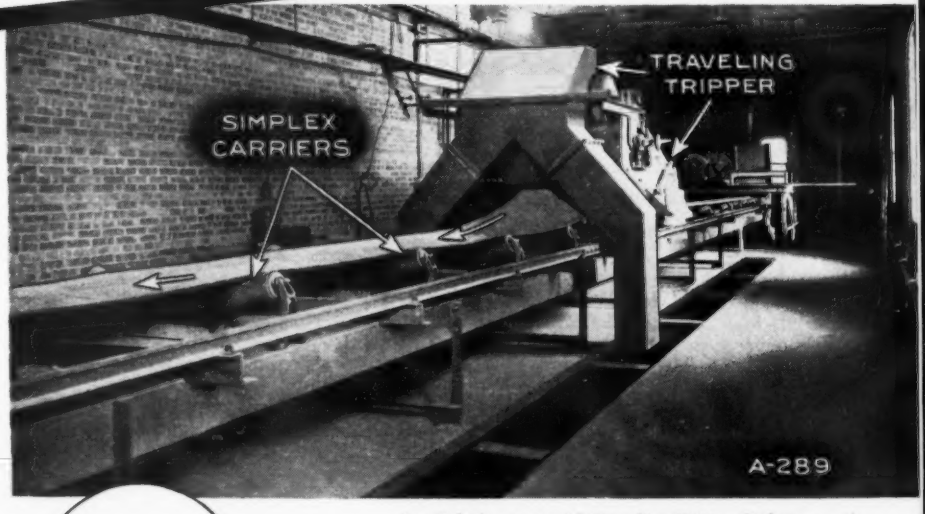
## Only the Wide Variety of S-A Equipment Offered So Many Methods

*A Z-shape Redler carries the coal from Track Hopper to storage bin.*

● No single Conveyor or Elevator is ideal for every coal or ash handling job. In many cases an S-A Redler Conveyor-Elevator will do a complete coal handling job, from receiving hopper to stokers . . . but, in many other instances, two or more types of equipment in combination are the logical solution to the problem.

*All types of equipment* for handling coal are included in the line of S-A Material Handling machinery, offering a free choice of the *one right method.*

Consult experienced S-A Engineers for recommendations on the best methods of moving coal and ashes at the *lowest possible cost per ton.*



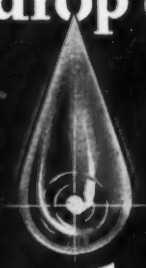

*S-A Belt Conveyor with Traveling Tripper discharges coal to any selected part of overhead storage.*

# STEPHEN S-A ADAMSON MFG. CO.

Chains and Sprockets · Belt Conveyors · Bucket Elevators · Crushers
Bin Gates · Pan Conveyors · SealMaster · Feeders · Screens
Speed Reducers · Redler Conveyors · Ball Bearings · Skip-Hoists · Winches and Car Pullers

**5 Ridgeway Avenue, Aurora, Illinois**

# Just a drop of water-



# harmless...

## *or is it?*

Although specially treated for use in your water consuming equipment, it may still contain a sufficient amount of water hardness to cause boiler scale, priming, foaming, pitting or corrosion or caustic embrittlement.

There's no question about feed water conditioned by nature's own method discovered in the new TECHNICAL Water Conditioning System . . . a perfect balance of water's mineral content with correct, natural *organic substances.*

## WATER CONDITIONING SYSTEM

TECHNICAL is a proven, natural system of individual formulas to fit each and every water type. It provides a special balance of water properties that definitely overcome scale, foaming, pitting, corrosion, priming, caustic embrittlement characteristic of boilers and condenser covering systems.

For your own satisfaction, investigate the new TECHNICAL System . . . Nature's own conditioning method developed under actual industrial operating conditions. Without obligation the coupon below will bring you the facts.

American Radiator & Standard Sanitary CORPORATION

Columbus, Ohio
Erie, Pa.
Fort Wayne, Ind.

**Midwest Water Treatment Company, Cincinnati, Ohio**

☐ Please send the new Technical System bulletin.
☐ Have a Water Treatment Company engineer call.

Name_____ Title_____

Company_____

Address_____

OR SEND TO

**WATER TREATMENT COMPANY OF AMERICA**

1159 Hodgkiss Street • Pittsburgh, Pa.



# XZIT

**FIRE SCALE and SOOT ERADICATOR**

*offers a simple way to step up* **BOILER EFFICIENCY** *without a shut-down!*

XZIT, a scientific compound, increases operating efficiency by eliminating soot and fire scale from boiler heating surfaces, uptakes, breechings and stacks. In addition, it discourages further formation of these undesirable carbon deposits and saves steam by reducing soot-blowing.

## INVESTIGATE XZIT TODAY

Write for complete information concerning the advantages of using XZIT.

**XZIT SALES CO.**
1031 CLINTON STREET
HOBOKEN, NEW JERSEY

# WAR CONDITIONS

# DEMAND PACKINGS BE CONSERVED!

In the 50 years existence of this Company, never have Belmont Packings been in greater demand, more urgently needed.

Packings are important! They are essential not only in the production, but in the operation of guns and mobile equipment—tanks, planes, ships.

Materials used in the complete line of Belmont Packings come from far-off places—asbestos, flax, jute, rubber, lubricants. Supplies of these critical raw products have been restricted, by regulation, to war uses. In substance, demands and problems are great, the like of which the world has never seen before!

How can Belmont meet the situation? It must continue to work to capacity with tools available.

How can the user meet the situation? He can conserve the use of packings along the lines of the four suggestions below.

THE BELMONT PACKING & RUBBER CO. — BELMONT — PHILADELPHIA, U.S.A.

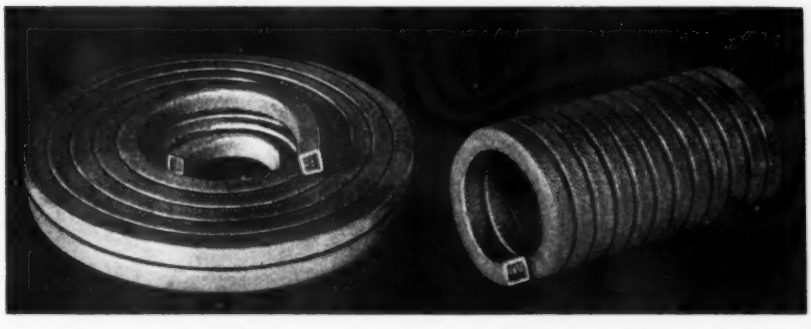
**A**—CONSERVE PACKINGS—When repacking, it may be found that a few rings of new packing inserted next to the gland may give added service. This will mean conservation of old packing retained in the stuffing box.

**B**—LUBRICATE MOVING PARTS—Keep rods, shafts and plungers thoroughly swabbed with oil or grease to alleviate frictional wear on packing. Where practicable, install oil lanterns.

**C**—CHOOSE SUBSTITUTE CONSTRUCTIONS—When material shortages make your desired type not instantly available, consult with your nearest Belmont distributor or with us for guidance on this question.

**D**—REFER TO THE BELMONT CATALOG—It's an invaluable packing guide of complete information on packings for all services . . . it contains informative charts; clearly illustrates and describes every Belmont packing; and suggests varied packing styles from which to choose a substitute packing, if necessary. Write on your Company letterhead for your copy.

There's a Belmont Packing for every service . . . Steam, Water, Oil, Gas, Air, Acid, Alkalis, and Ammonia. Forms include Rings, Coils, Spirals, Reels, Spools, Sheets, and Gaskets.



# BELMONT PACKINGS

**The Belmont Packing & Rubber Company**

**Butler and Sepviva Streets Philadelphia, Penna.**

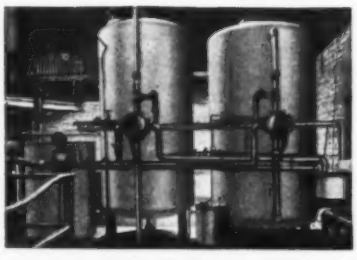
# BOILER FEED-WATER TREATMENT

## *ENGINEERED BY ILLCO lowers operation costs!*

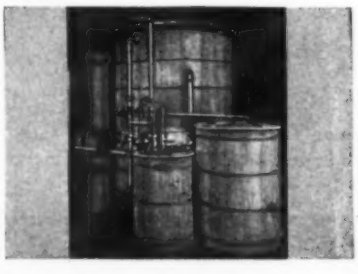
Economical to install, easy to operate, *external* treatment plants have been engineered by ILLCO for a wide variety of boiler feed-water problems. Equipment removes the detrimental constituents of the raw water at a cost which is less than that of older, inferior methods. Any desired alkalinity can be established and maintained.

### *CONSTANT WATER QUALITY*

ILLCO External Treating Equipment produces water of a constant quality without continual supervision.



***MACHINE TOOL PLANT*** ILLCO Duplex Feed-water Treatment Unit, blending sodium zeolite water with hydrogen zeolite water to produce a boiler make-up with zero hardness and with very low total solids and alkalinity.



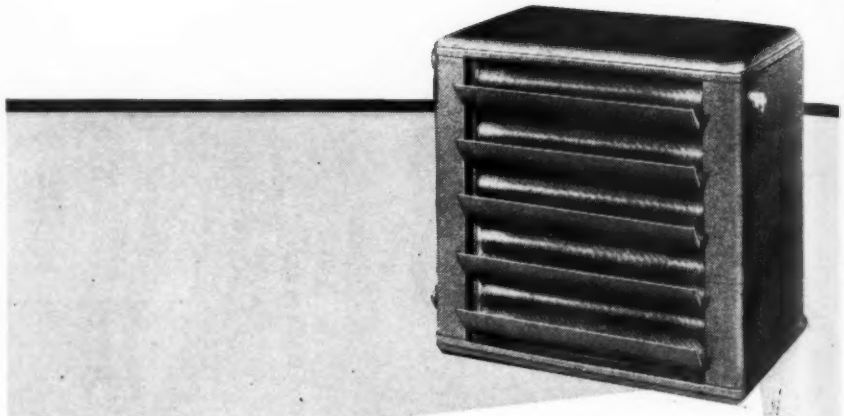
***MILK PROCESS PLANT*** Single-tank ILLCO Combination-Regeneration Boiler Feed Unit, regenerated simultaneously with salt and acid; produces same results as Duplex Equipment above. Cypress tanks avoid use of critical materials.

**ZEOLITE SOFTENERS, FILTERS, AERATORS,** etc. are also manufactured by ILLCO—Water Treatment Engineers. Send for complete descriptive literature.

**ILLINOIS WATER TREATMENT CO.**
853 Cedar St., Rockford, Illinois

*TESTED IN THE LABORATORY* ILLCO-WAY *PROVED IN THE FIELD*





# FEDDERS OFFERS THIS RESOLUTION

**WHEREAS:** heating is a Wartime necessity, and
**WHEREAS:** the Men of Fedders recognize their responsibility to those who sell, install and use heating equipment: we offer this Resolution summarizing policies put into effect at the beginning of this emergency:

1. **RESOLVED:** that the Industrial Heating Division of the Fedders Manufacturing Company will endeavor to maintain an equitable balance between productive capacity and backlog of orders, so that common sense shipping promises can be given and sustained.

2. **RESOLVED:** that in the interests of conservation, Fedders engineers shall take full advantage of alternate materials; and that such redesign shall be carried out, not simply with a viewpoint of substitution, but with the exercise of sound metallurgical, engineering and manufacturing practices to assure efficient and reliable performance.

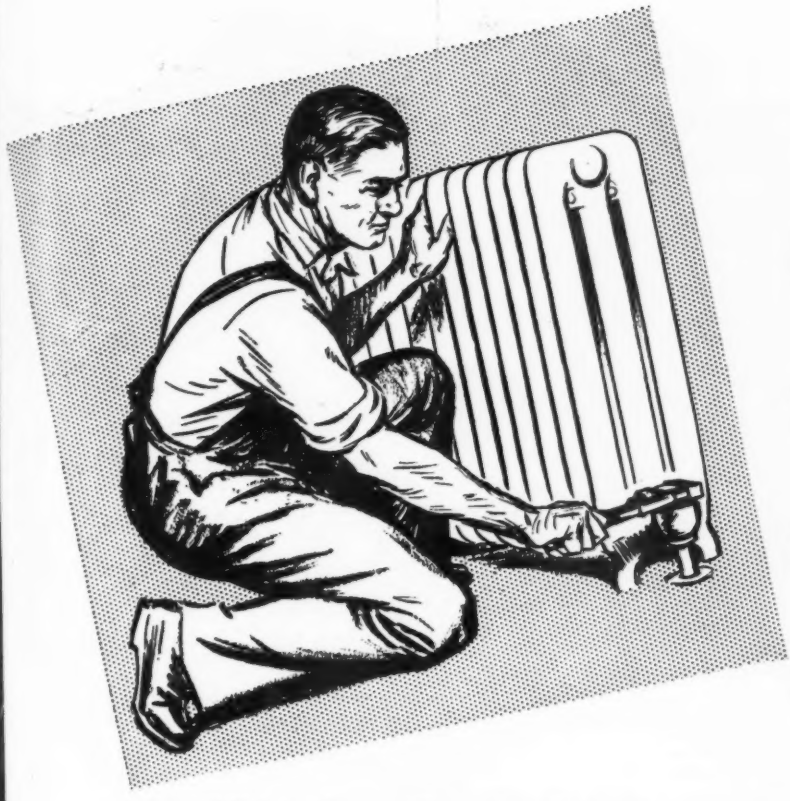
That, in brief, is a statement of the Wartime Policy of the Fedders Industrial Heating Division. It is not just a prediction; it is taken from the record. You will enjoy doing business with Fedders.

**fedders**

**BUFFALO, N. Y.**

**Manufacturers of unit heaters, blast heating coils, cooling coils, electric refrigeration equipment, heat exchanger equipment for military aircraft, automotive radiators, metallic machine gun belt links.**

Let this be your contribution to Victory: Make your heating equipment serve longer by good care... Conserve fuel by promptly replacing worn-out or inoperative parts.



# How to get full heat from every Radiator

To get full heat from radiators ample steam must reach them... steam must be held until condensed... air and water must be removed. For these results, inspect regularly and:

**(1)** Make sure radiator supply valves are open. (An occasional drop of oil on valve stem makes them open easier and preserves packing.) Worn-out seat discs and packing should be replaced.

**(2)** Remove obstructions from front and top of radiators. Packages, clothing, etc., on radiators reduces their heat output.

**(3)** Take out trap interior *when cool* and remove dirt and scale. Wipe trap seat and valve clean with rag or waste dipped in kerosene.

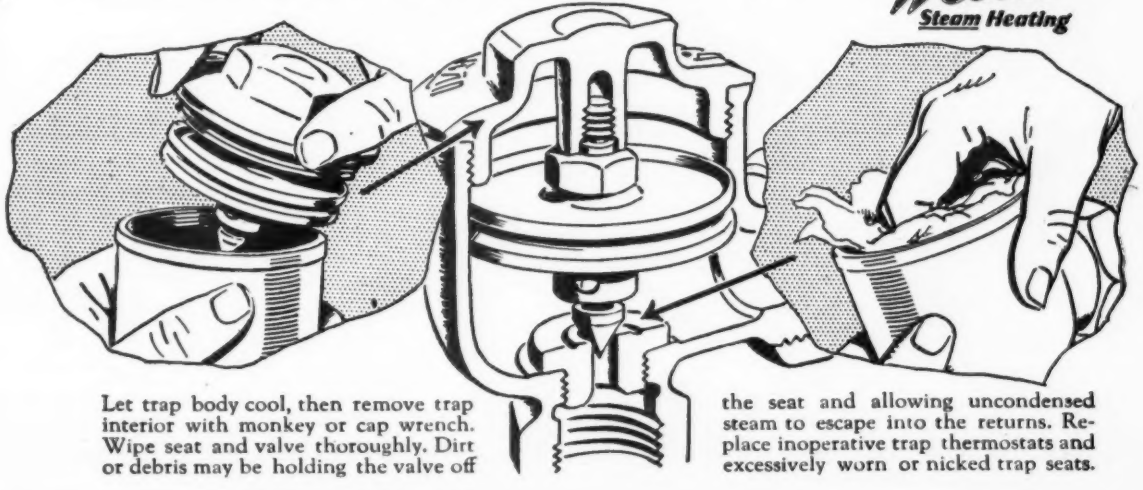
**(4)** Replace inoperative trap thermostats and excessively worn or nicked trap seats.

Your nearest Webster Representative will tell you how to detect inoperative traps... look in your telephone book or write us for his address. When trap interiors must be replaced, use genuine Webster Thermostatic Assemblies—they can be inserted in old trap bodies without disturbing piping. All work can be done right on the job.

ARMY E NAVY

WARREN WEBSTER & CO., Camden, N. J.
Pioneers of the Vacuum System of Steam Heating :: Est. 1888
*Representatives in principal cities :: Darling Bros., Ltd., Montreal, Can.*

Webster Steam Heating



Let trap body cool, then remove trap interior with monkey or cap wrench. Wipe seat and valve thoroughly. Dirt or debris may be holding the valve off the seat and allowing uncondensed steam to escape into the returns. Replace inoperative trap thermostats and excessively worn or nicked trap seats.

These Frahm Resonant-Reed Tachometers have taken a beating. Designed for permanent mounting, they have been used as portable instruments, continuously for 22 years, on the test floor of a turbine manufacturer. When returned to us for repair and recalibration we found that, except for one reed which had been broken, no reed registered more than 2% out of calibration and nearly all were correct within 1%. The instruments have been repaired and are now back in the same hard service.

Frahm Resonant-Reed Tachometers are simple and rugged in construction . . . accurate and dependable in operation. With no parts to wear, adjust, lubricate or renew they give years of trouble-free service. Built in types for permanent mounting, and for hand use in servicing, testing, installation and maintenance work. Various ranges available from 900 to 30,000 R.P.M.

For a complete description of the Frahm Tachometer together with list of types and ranges commonly supplied, write for Bulletin 1590 P.

*The same instruments shown above, after repair and recalibration in the Biddle Repair Department.*

**JAMES G. BIDDLE CO.** • **1211-13 ARCH STREET PHILADELPHIA, PENNA.**

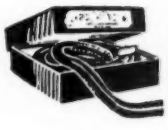
# ONE SPOOL

## *provides a stock of packing for many sizes of valves*

**. . . because EACH INDIVIDUAL STRAND of PALMETTO Twisted Packing is a fully lubricated piece of packing . . . saturated with special PALMETTO graphite lubricant.**

**Therefore, when you buy a spool of this self-lubricating packing, just separate the strands for different sizes of valves . . . you don't need a separate stock for each valve size.**

WRITE FOR LITERATURE



**BRAIDED**
For rods and shafts; layer over layer construction insures uniformly even bearing surfaces.

**TWISTED**
For valve stems, each strand a perfect piece of lubricated packing.

**GREENE, TWEED & COMPANY**
Bronx Blvd. at 238th St., New York, N. Y.

**PALMETTO**
*for steam, hot water, air.* PALCO *for water.*
PELRO *for oils.* CUTNO *for alkalis.*
SUPERCUTNO *(blue asbestos) for acids.*
KLERO *for foods.*
SELF-LUBRICATING
**PACKINGS**

# ROBINS
CONVEYING BELT COMPANY

## *changes its name!*

*For nearly half a century,* we've borne this fine old name . . . borne it proudly . . . made it the synonym and symbol of quality not only here but in many other parts of the world. Now we lay it aside tenderly . . . not entombed but enshrined.

*In its place, we adopt a new name* . . . a name more truly definitive of the range of our products, the extent of our services . . . services to those who mine coal, ore, minerals, sand, gravel . . . services to those who use these elements to manufacture the implements of industry which make this country great and strong and victorious. To these people, these corporations, ROBINS has long been known and honored for its pioneering spirit . . . its daring to try the seemingly impossible in order to advance the industrial economy of the nation and the world.

*During the first decade of its existence,* ROBINS conceived and introduced 41 innovations in the field of materials handling methods and machinery.

*In the years since then,* other equally radical and constructive advancements have been initiated by ROBINS. Because they are so wide in variety, in utility and in application, we believe it advisable to adopt a name more encompassing, a name less restrictive in its connotations than Robins Conveying Belt Co.

*And now* — without any change in directorship, management or corporate structure, we become: ROBINS CONVEYORS INCORPORATED.

FOR MATERIAL AID IN MATERIALS HANDLING . . . . ***It's ROBINS***

## ROBINS created

THE FIRST belt made especially for conveying materials
THE FIRST troughed belt conveyor
THE FIRST belt with a thick cover at the center
THE FIRST splice made with a portable vulcanizer
THE FIRST single-plane idler
THE FIRST stepped-ply belt
THE FIRST protected screw takeup
THE FIRST self-reversing tripper
THE FIRST belt conveyor for handling stone
THE FIRST belt conveyor for carrying coal
THE FIRST belt conveyor for sand and gravel
THE FIRST conveyor storage system
THE FIRST picking belt
THE FIRST belt conveyor in a gas works
THE FIRST belt conveyor that ever handled copper ore
THE FIRST mechanical ore bedding system
THE FIRST belt system for loading colliers
THE FIRST conveyor for handling excavated material
THE FIRST system of belt conveyors to handle mixed concrete
THE FIRST tandem-driven belt conveyor
THE FIRST tripper with a side-discharge belt
THE FIRST conveyor belt 96 inches wide—the widest ever built
THE FIRST conveyor on a dredge
THE FIRST counter-weighted hoisting tower
THE FIRST "Ward Leonard System" hoisting tower
THE FIRST hydraulic hoisting tower
THE FIRST power-saving idler
THE FIRST belt-unloading system for boats
THE FIRST travelling bridge using a belt for stocking and a bucket for reclaiming
THE FIRST airplane-tripper
THE FIRST belt feeder
THE FIRST ship loading plant with tripper and loading boom
THE FIRST conveyor in a tunnel under a storage pile
THE FIRST rotary grizzly
THE FIRST rotary stone grizzly
THE FIRST training return idler
THE FIRST positive training troughing idler
THE FIRST circle-throw screen
THE FIRST single-shaft circle-throw screen
THE FIRST to use cider cloth on conveyor belting
THE FIRST self-feeding coke wharf

ENGINEERS • MANUFACTURERS • ERECTORS

**ROBINS**
**CONVEYORS**
INCORPORATED
(ROBINS CONVEYING BELT CO.)
PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

# QUALITY CONTROL
## OF WOLVERINE CONDENSER TUBES

## BEGINS RIGHT HERE – AT THE CASTING

## A sample of every heat goes to the laboratory before the cast blocks are made into tube

The recognized quality of Wolverine Condenser Tubes is due, among other things, to careful control—that starts to function not *after* the tubes are made, but at the very beginning of the process, even *before* the base size tube is made.

The metallurgical laboratory works in close cooperation with the casting department and maintains complete and continuous control over the entire operations. In addition, a sample of every heat goes to the lab. to make sure that the metal measures up to the various specifications for condenser tube alloys.

This control insures that every foot of Wolverine Condenser Tube you put into service will meet the highest standards obtainable.

*ANNOUNCEMENT*

**REPUBLIC SUPPLY CO.**

PETROLEUM BUILDING HOUSTON, TEXAS

has been appointed distributor for Wolverine Tube products for the states of Arkansas, Louisiana, Oklahoma, Texas.

CALUMET AND HECLA CONSOLIDATED COPPER COMPANY

**WOLVERINE TUBE DIVISION**

*Seamless Copper — Brass*

1435 CENTRAL AVENUE DETROIT, MICHIGAN

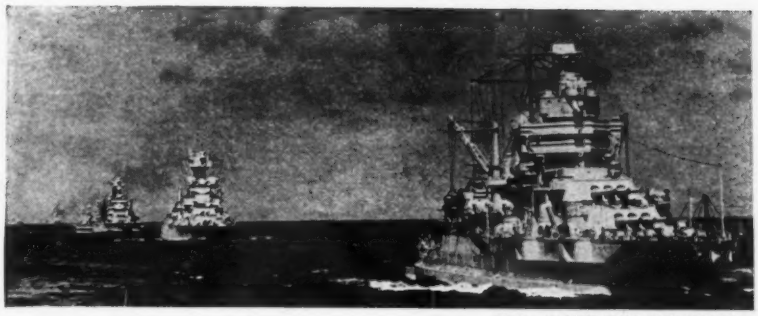


Photo: OFFICE WAR INFORMATION

## Take a Good Look at these BATTLESHIPS

To any motorist with bald tires, they have a particular significance. Each one of these gigantic fighting machines requires sufficient rubber to make 17,000 automobile tires. That would keep many a motorist in tires for a long time.

Ships, Airplanes, Tanks, and numerous other fighting units required at the front, all need enormous amounts of rubber.

Quaker is playing an important part in supplying our Government with the vital rubber products and orders coming from the Government and Defense plants have the right of way. You would not want it otherwise.

Please be patient if your order with us seems a trifle long in reaching you. We are doing everything possible to spread equitably what permissible civilian Industrial Rubber Products we can manufacture.

### INDUSTRIAL RUBBER PRODUCTS

Rubber is scarce, but not extinct for use in many civilian plants. It is not patriotic to allow your plant to lose production for want of Industrial Rubber Products.

The Government will permit the use of rubber products in many plants that are recognized as being on important war work. Consult Quaker whenever Industrial Rubber Products should be used. Our experience of manufacturing and knowledge of current regulations are at your service.

★ *Blast the Japs out of the Rubber Pile!*

*KEEP ON BUYING MORE WAR BONDS* ★

REG. U. S. PAT. OFF.

## QUAKER RUBBER CORPORATION

*OVER 58 YEARS CONSISTENT QUALITY INDUSTRIAL RUBBER PRODUCTS*

PHILADELPHIA · NEW YORK · CHICAGO · HOUSTON

*Western Territory*

QUAKER PACIFIC RUBBER COMPANY · SAN FRANCISCO · LOS ANGELES

---

## TOO TOUGH A NUT FOR VIBRATION TO HANDLE

UNSHAKO SELF-LOCKING NUT

Reg. U. S. Pat. Off.

That locking ring—with its brake band principle—positively prevents vibration from unwinding the "Unshako". YET—it can be backed off with a wrench and used again and again.

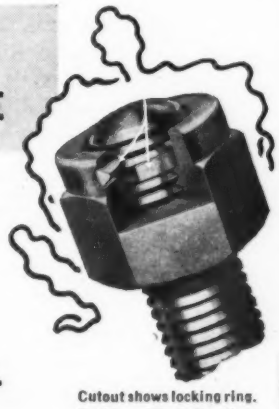
*Write for Catalog!*

**STANDARD PRESSED STEEL CO.**

JENKINTOWN, PENNA. BOX 557

— Branches —

Boston • Detroit • Indianapolis • Chicago • St. Louis • San Francisco



Cutout shows locking ring. Pat'd. and Pat's Pending.

# *Veterans hold the Home Front*

Back into overalls they go — men that had retired to easy chairs — valves that had been called useless and retired to a storehouse corner. They've got to hold the "home front" now. Engineers are seeing to it that recent installations are maintained with care and that old-timers are restored with replacement parts, spruced-up and put back in the ranks.

Fortunately, Ludlow quality means that even cast-off old-timers may still give service with a reasonable replacement of working parts. Under priority, Ludlow can furnish these parts for you — should priority on new valves be impossible or difficult to get. Our full co-operation is always assured.

**THE LUDLOW VALVE MFG. CO., INC.**
**TROY, NEW YORK**

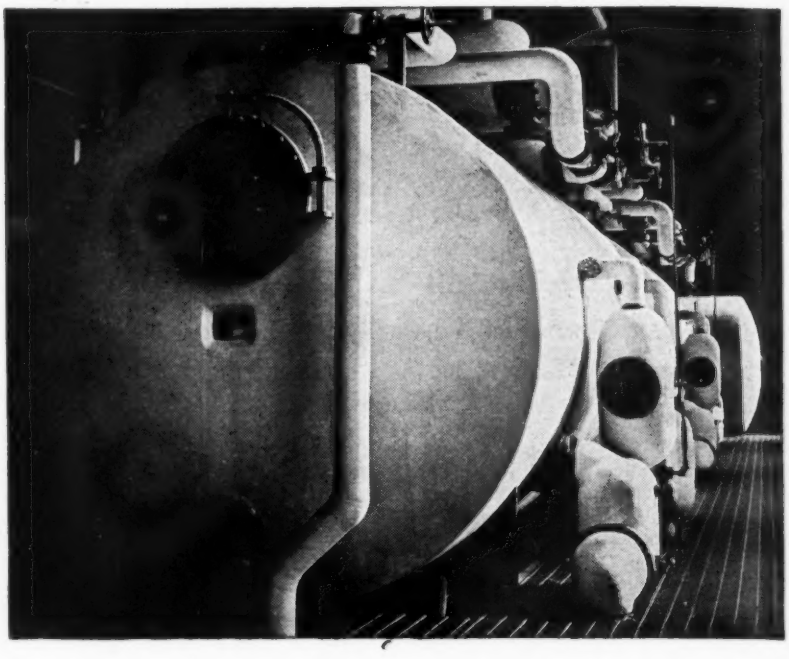
*Construction Features:* Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Rings are cleaned throughout stroke action. Gates are wedge-locked directly opposite ports and completely unwedged before raising. Ample tolerances provide easy action. Simple construction permits easy replacement of parts.

V-13

# LUDLOW VALVES

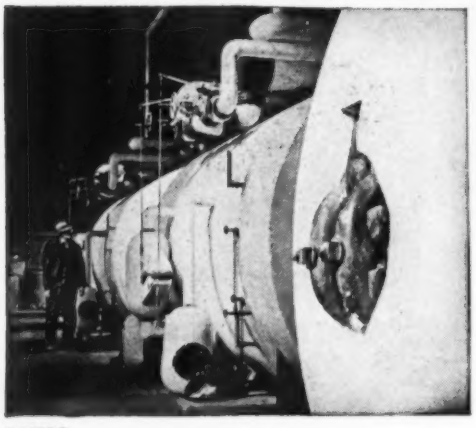
SINCE 1866

## MORE AND BETTER EQUIPMENT FOR FIGHTERS



# Ruberoid Insulation helps the Quartermaster Corps to meet the issues of Government Issue

**MATERIALS**—Feedwater heaters; insulation, 85% Magnesia. Other Ruberoid materials required for this "City within a city": Boilers—"48" Copr-Fibre Blocks; Pipes—Imperial Asbestos and Woolfelt Pipe Coverings.



**MEN**—Not merely workmen, but technicians who knew the most efficient way to solve this many-sided insulating problem. Installation by Achenbach & Butler, Inc., leading Philadelphia insulating engineers. Other Ruberoid Approved Applicators are located in principal industrial areas throughout the U. S.

**METHODS**—Another interesting application (Imperial Asbestos Insulation on 12″ Pipe) which illustrates the value of Ruberoid's broad knowledge of, and experience with, difficult insulating jobs.

This single view of a remarkable Ruberoid installation at the Philadelphia Quartermaster Depot just begins to tell the story of insulation at work in the war effort. *Thirty-five miles* of Ruberoid pipe insulation alone went into this job—in six huge buildings, where thousands of workers handle, process, and repair the innumerable "G.I." items needed for Uncle Sam's land fighters.

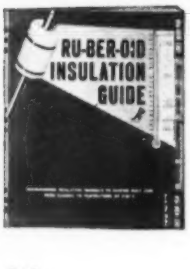
The Ruberoid System of Materials, Men and Methods is doing another good job, and for good reason. First, the Ruberoid insulating line meets all needs for all types of thermal insulations. Second, the men who work with these materials are Ruberoid Approved Applicators—every one an insulating expert. And because Ruberoid engineering embraces all types of installations, you get the best in research and methods that modern insulating technology can offer.

The *best* materials; the *best* men; the *best* methods; that's the Ruberoid way—the best way to insulate!

**RUBEROID INSULATION PRODUCTS**

Imperial Asbestos Insulation
85% Magnesia Insulation
Air Cell Pipe Covering
Woolfelt Pipe Covering
Sponge Felt Pipe Covering
Mineral Wool Insulations
High Temperature Insulations
Low Temperature Insulations
Asbestos Papers & Boards
Insulating Cements

**WRITE FOR NEW INSULATION GUIDE**




A short but complete and accurate reference guide. For a free copy address

The RUBEROID Co.,
Dept. P5,
500 Fifth Avenue,
New York, N. Y.

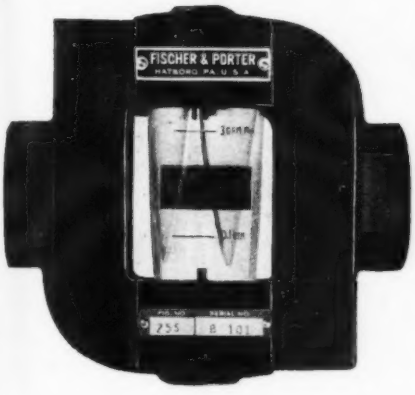
**MATERIALS, MEN, METHODS—all 3 with**

# RU-BER-OID
## THERMAL INSULATIONS

*Service to Industry since 1886 . . . Genuine* **RU-BER-OID** *Roofings and Building Products*

## Important Notice for PROCESS DESIGN INSTRUMENT } ENGINEERS

### New Flow Rate Indicator gives instantaneous response to flow change




The Fischer & Porter Rota-Sight is the logical flow rate indicator for any application where an approximation of the amount of fluid flow rate is an operating aid and necessity. The Rota-Sight has literally thousands of uses such as for measuring flows of cooling water, air agitation, gas blanketing, gas leakage, lubricating oils, filter feeds, filter back wash, overflows, circulating mediums and coagulating additives. Nothing as simple and inexpensive as the Rota-Sight has ever been available for the countless fluid flows where you would like to know exactly what you are doing.

The Rota-Sight offers these distinctive advantages:

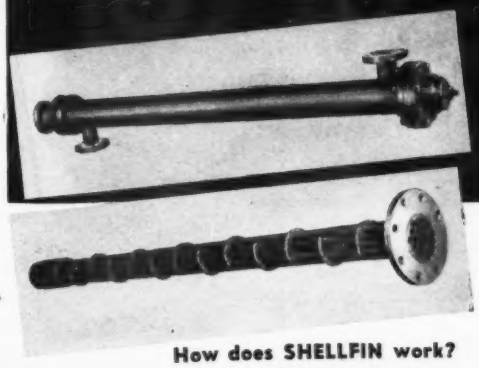
1. Tells the operator the instant that the flow changes.
2. The indicating rotameter-type float gives wide range over short scale length.
3. Float is visible in opaque liquids.
4. Warns operator when flow is too high or too low.
5. Easy to install — universal inlet and outlet connections.
6. Nothing to get out of order.
7. Inexpensive.
8. Sizes ½" to 2½"—flows to 57GPM or 130CFM.
9. Available in cast iron, bronze, and steel as standard materials—obtainable in any corrosion resistance metal that may be cast, such as stainless steel, hastelloy or durimet.

We suggest that you take immediate operating advantage of this new, sensitive flow rate indicator. Write today for Bulletin 101, Fischer & Porter Company, 605 County Line Road, Hatboro, Pennsylvania.

F&P ROTA-SIGHT

## Introducing the SHELLFIN

### the STANDARDIZED shell & finned tube HEAT EXCHANGER



*Pat. Applied for

**What is the SHELLFIN?**

It is a *standard design* shell and finned tube heat exchanger conceived and developed by Downingtown engineers to be built on a cost-saving, time-saving production basis. With only minor changes in its construction, such as baffle spacing and length combinations of units, it meets the conditions found in a wide variety of uses for heat exchangers.

**How does SHELLFIN work?**

One fluid passes through the tubes, cooling or heating the second fluid which passes outside and across the tubes in the shell, its path being directed by the "segment cut" baffles in the tube bundle, exactly like most other units, EXCEPT that the finned tubing compensates for difference in heat transfer rate between shell fluid and tube fluid.

**Where can the SHELLFIN be used?**

Use it for many forms of heat exchange between two fluids in medium temperature ranges, where the heat transfer rate of one fluid is materially greater than that of the other. Use it for *cooling* oils, benzine, toluene and similar organic compounds, alcohols, chemical compounds generally . . . for cooling jacket water for diesel or gas engines, drain and condensate cooling . . . for air cooling in compression systems . . . for *heating* in any of the above or similar fluids . . . for *condensing* organic vapors, hydrocarbon oil vapors, refrigerants . . . for *evaporating* organic liquids, light hydrocarbons and refrigerants.

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HEAT EXCHANGERS

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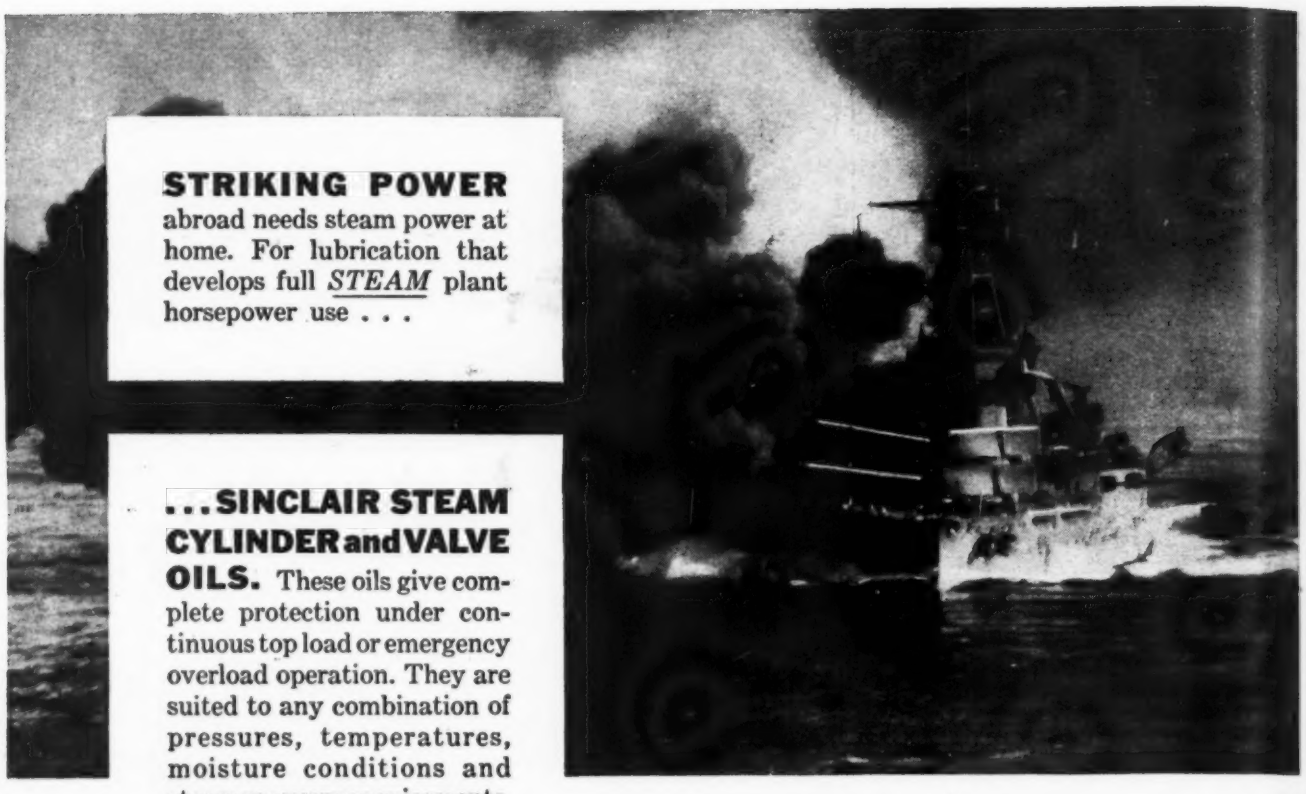

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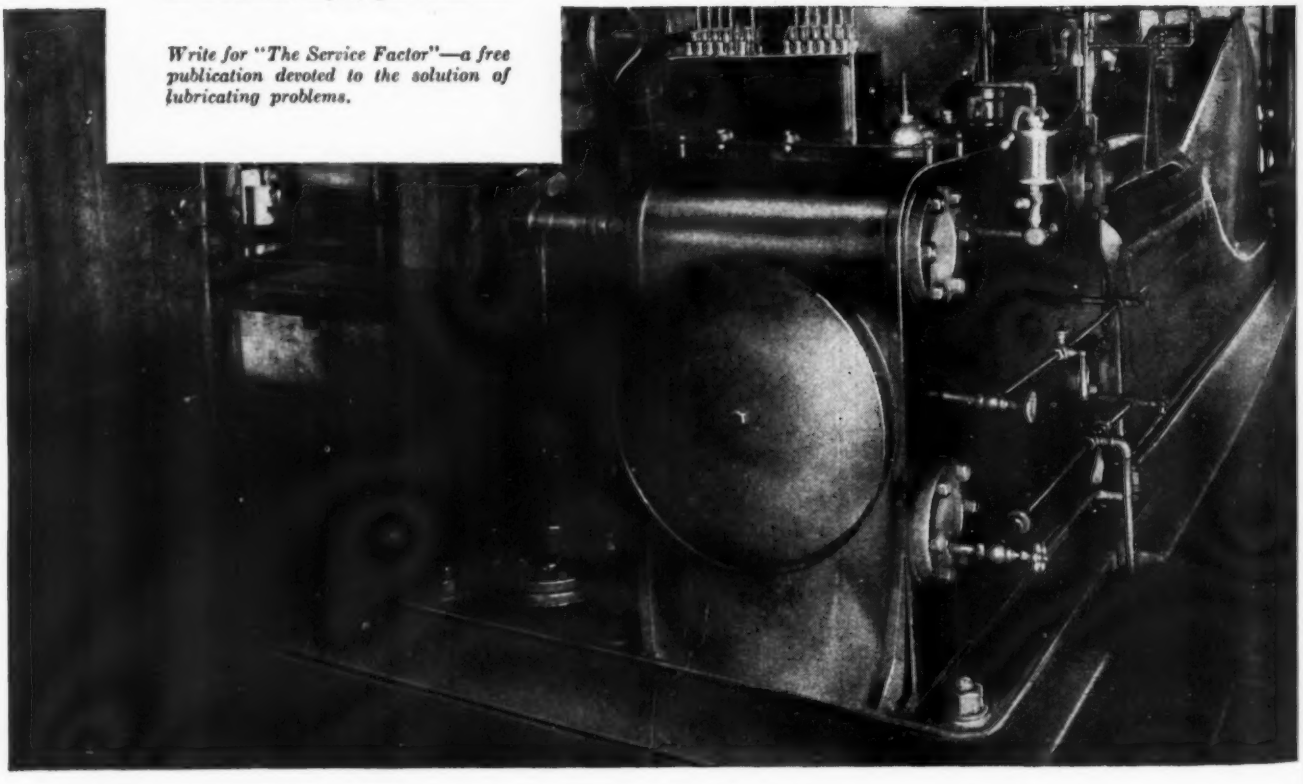

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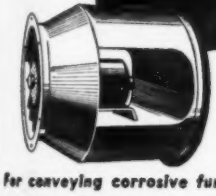

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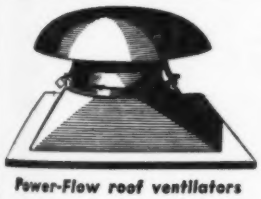
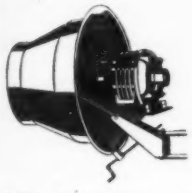


Power-Flow roof ventilators



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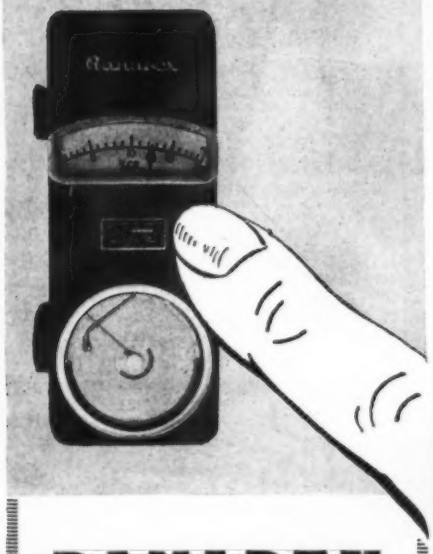

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HERE'S a simple plan that cuts heat loss as much as 20%: Install Ranarex,* the mechanical $CO_2$ Indicator and Recorder. With it you can easily measure the $CO_2$ in flue gases. Then adjust combustion until the percentage of $CO_2$ is at precisely the point found to be correct for your load. This gives you the last bit of power possible from the fuel you burn.

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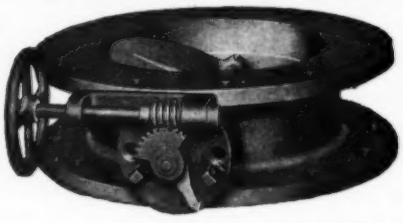

**How? Because these simple, accurately built units *retain* their initial air-tightness, perfect control and ease of operation; they are *lastingly* dependable; and they have no maintenance cost.**

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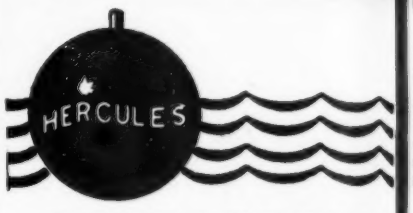


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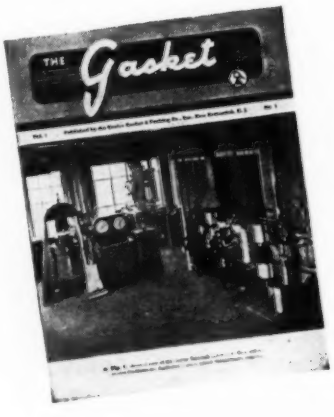


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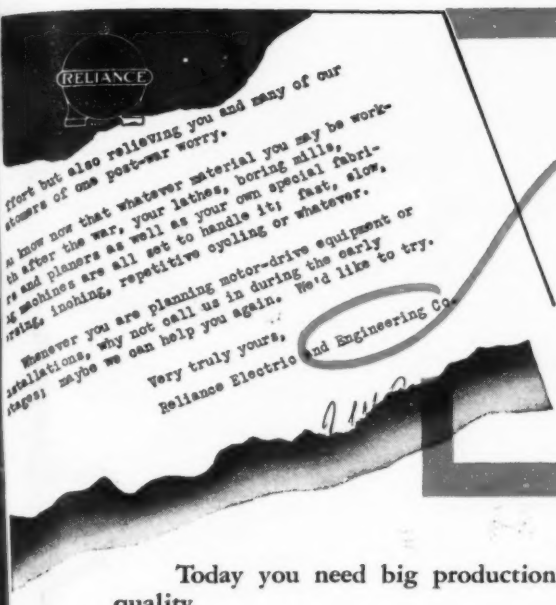
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stallations, why not call us in during the early
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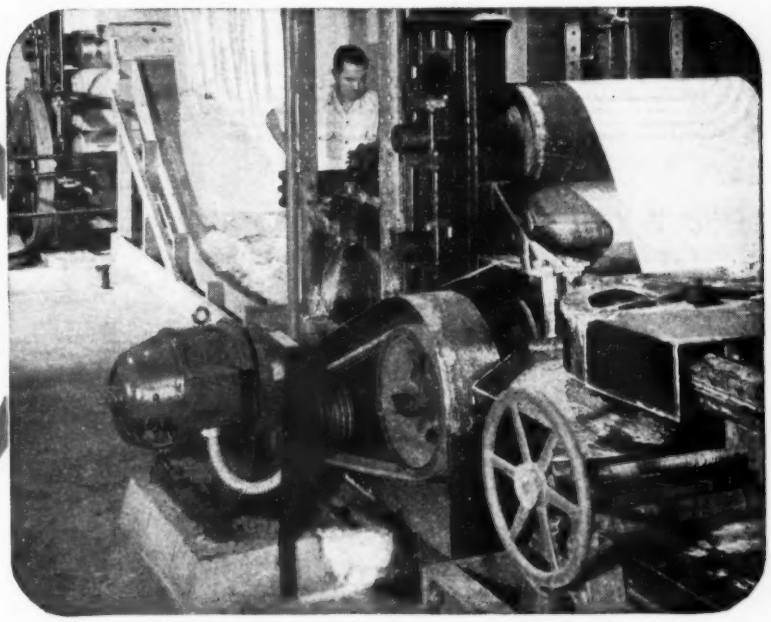
**Applying them to boost production and improve quality is APPLICATION ENGINEERING. That's our business.**



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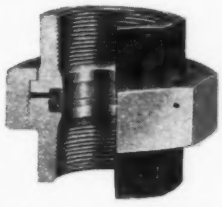

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| | STEAM OR HOT OIL | | | COLD WATER OIL OR GAS NON-SHOCK |
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• The HYDRO, bronze to bronze seat, forged steel union is manufactured by the originator and pioneer of steel unions for over 30 years, made to A.A.R. inside dimensional specifications and interchangeable part for part with our PETRO and MARK, also with all A.A.R. UNIONS. HYDRO UNIONS HAVE EXTRA HEAVY ENDS AND NUT. NUT THREADS ARE PERMANENTLY LUBRICATED AND RUST-PROOFED. THE BRONZE SEATS ARE COMPLETELY FUSED TO THE STEEL, THEN MACHINED AND COLD ROLLED. THE COLD ROLLING OF THE SEATS DOUBLES THE BRINNELL HARDNESS OF THE BRONZE. SAFETY FACTOR AGAINST RATED WORKING PRESSURES APPROXIMATELY 5 TO 1.

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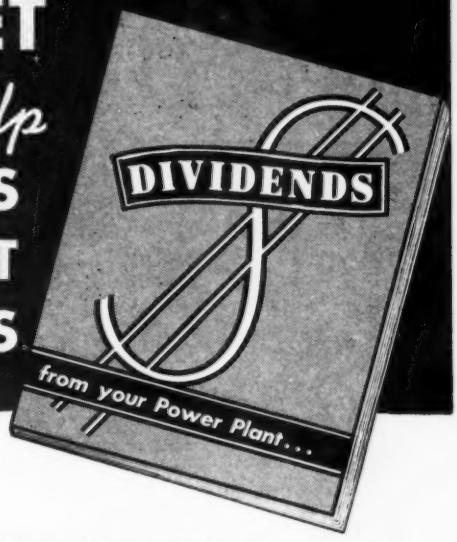


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A.M. PICK-UP

"Rush new motor Air Express" was the order a supplier received at 9 A.M. Ready for pickup at 10, it was taken to the airport, flown hundreds of miles to destination . . . and installed on a vital war job that same afternoon.

# This motor was delayed

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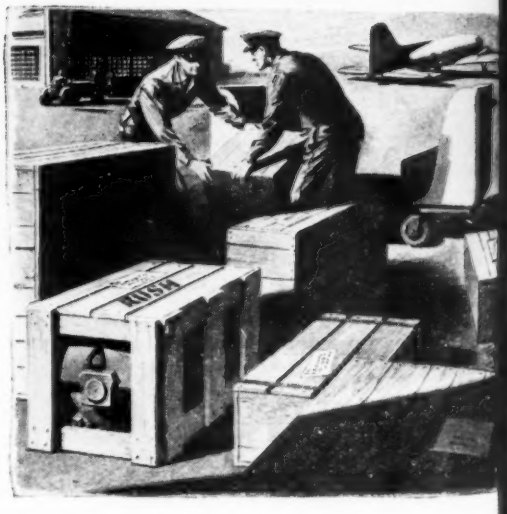
Shipments ready for morning pickup but held for "late afternoon" routine, may be subject to delay. Heavy, peak-hour traffic may keep them grounded until a midnight or early morning plane.

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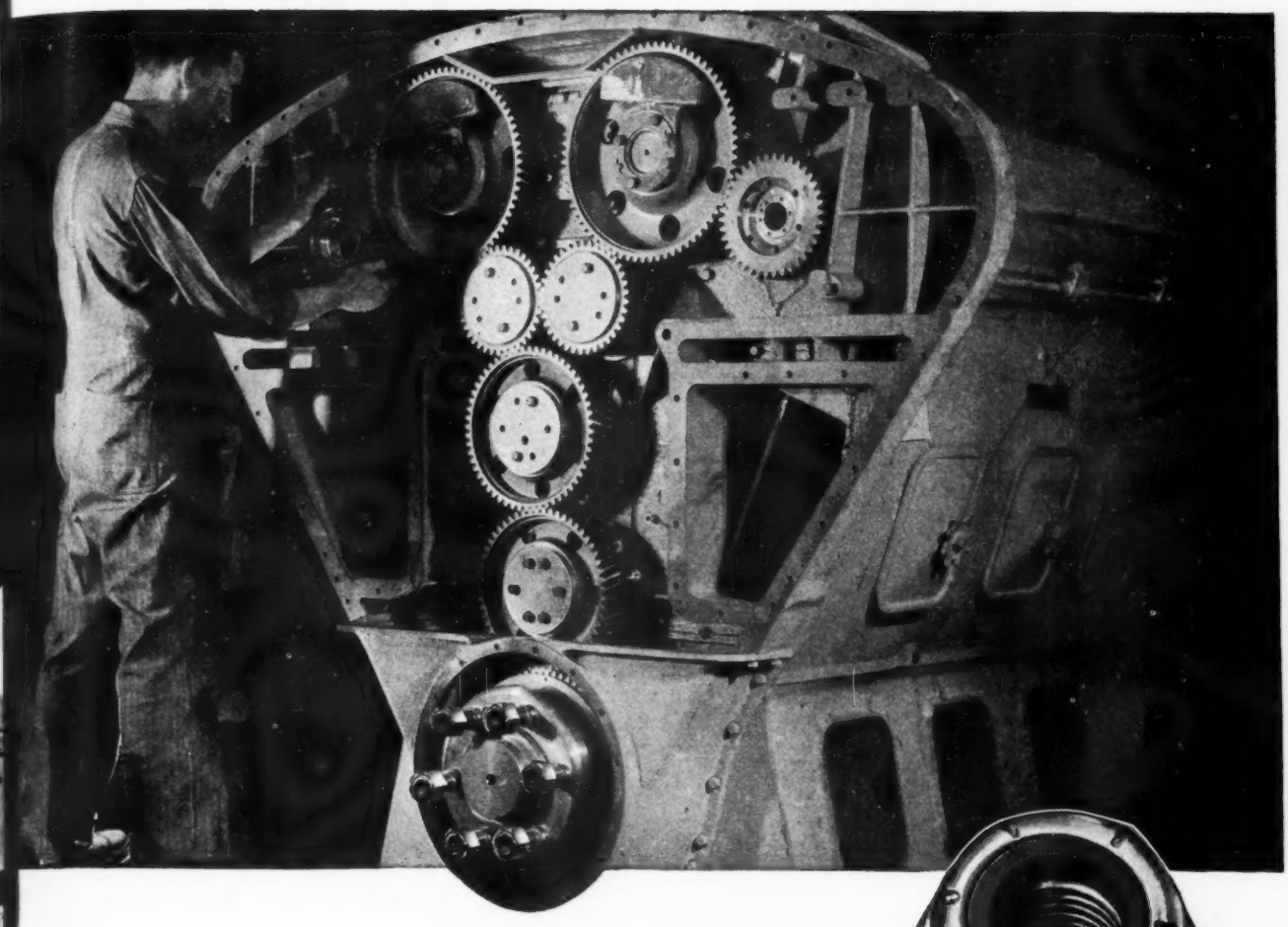
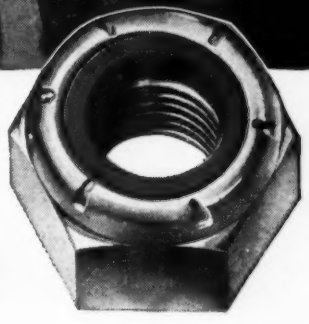




# SIX NUTS THAT BRIDLE A THOUSAND HORSEPOWER

THIS is the business end of a powerful Diesel engine.

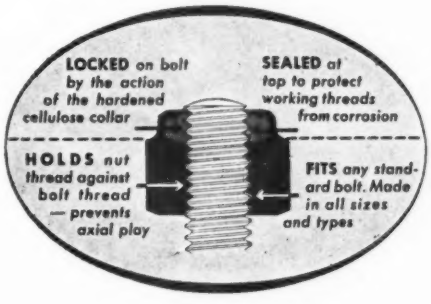
Well over a thousand horsepower spins through that coupling – through those six studs.

To connect that coupling, old-style lock fastenings wouldn't do. They couldn't both lock and be tightened to spread the load evenly. So studs failed.

The solution shows in the photo – Elastic Stop Nuts.

With these fastenings, uniform pressure was obtained as well as complete security against nuts working loose.

In the peacetime production to come, equally puzzling problems will plague manufacturers.


LOCKED on bolt by the action of the hardened cellulose collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

And we are prepared to help. Our engineers who today are solving war production problems will be ready to share their wide experience with you.

Whenever you have a fastening job let us know. Our men will work with you on it and recommend the correct Elastic Stop Nut to produce a better product or to facilitate its manufacture.

## ELASTIC STOP NUTS

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APPLICATION

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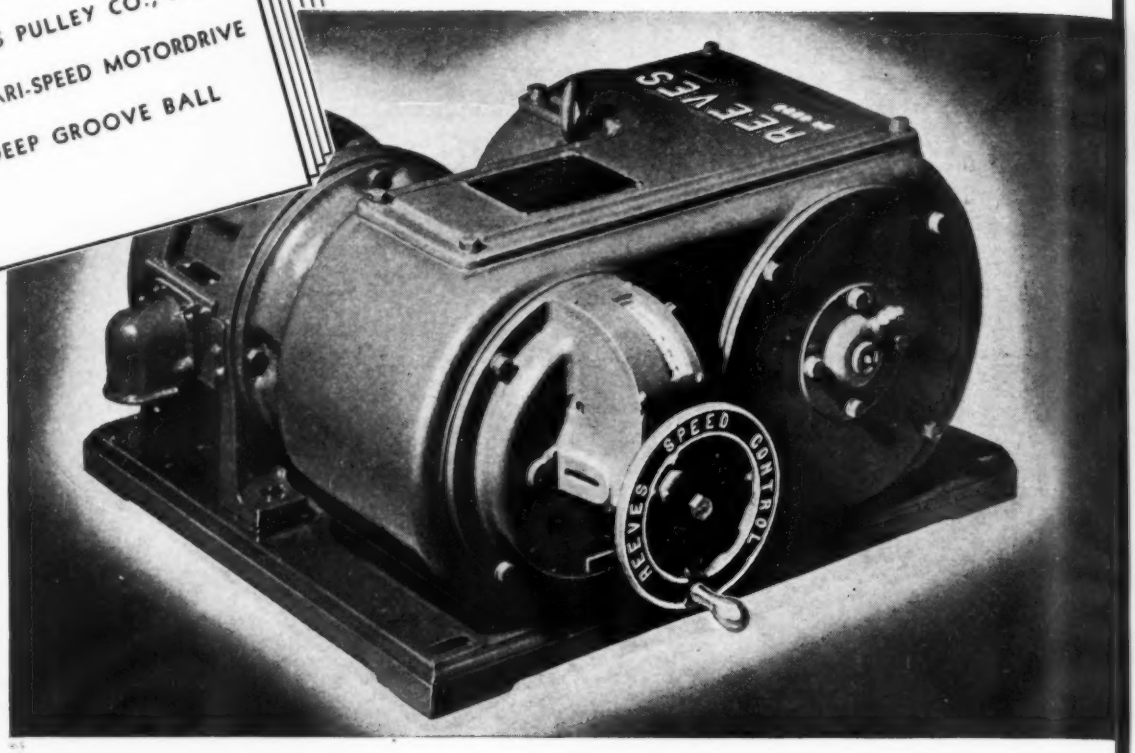
Machine VARI-SPEED MOTORDRIVE

Bearings DEEP GROOVE BALL



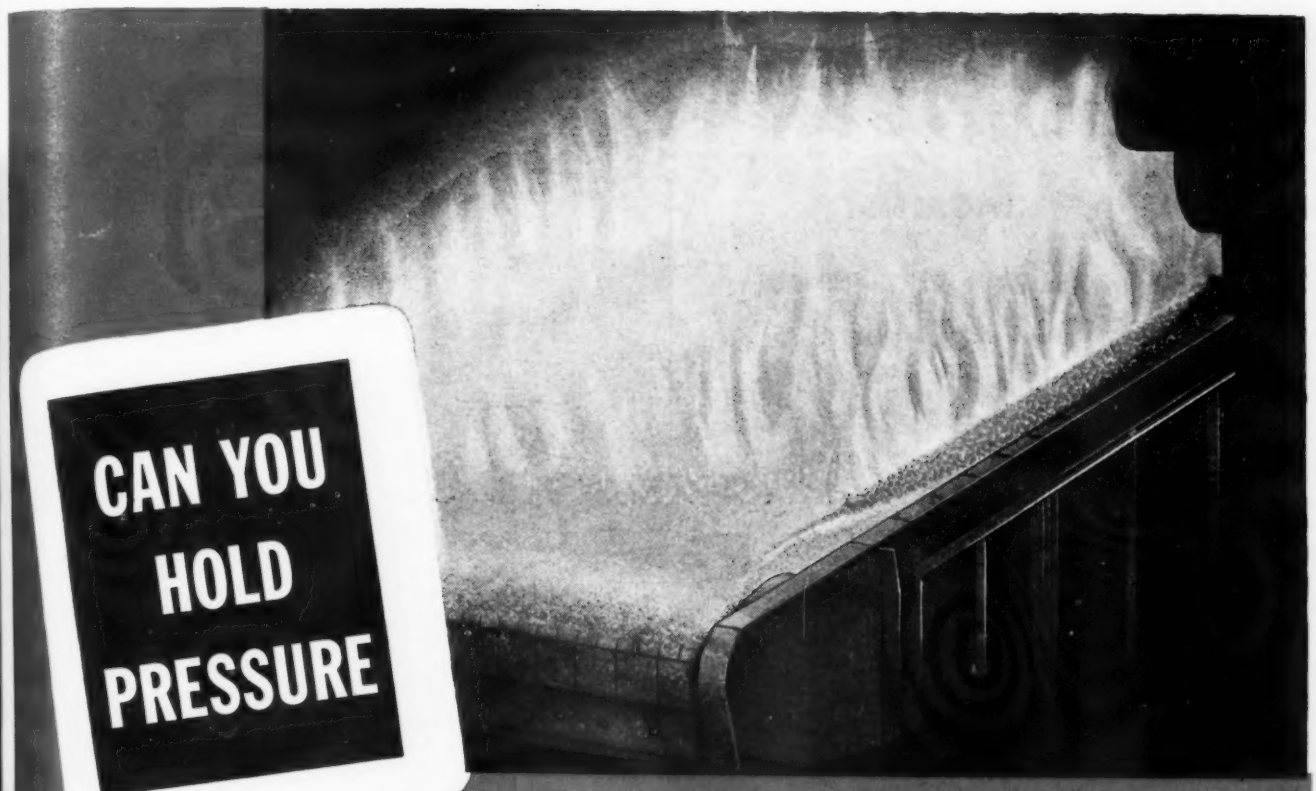

# REEVES *packaged drives*

## ON SKF BEARINGS

On production machines where space is limited or where direct connection to the machine is necessary or desirable, you're apt to find these Reeves Vari-speed Motordrives. For inside this compact, self-contained package, a constant speed motor and a speed control mechanism make use of SKF Bearings to assure smooth operation at high speeds. That SKF's were selected for this unit indicates the foresight of engineers who appreciate the ability of accurate bearings to absorb radial and thrust loads easily . . . that never quit on the job. Performance from a bearing means performance from the machine of which it is a part. 5291

SKF INDUSTRIES, INC., PHILADELPHIA, PENNA.

ARMY E NAVY




# WITH WHATEVER COAL YOU CAN GET?

● War time shipping embargoes threaten to eliminate long haul shipments of "premium" coals, and force every plant to buy from the nearest mines regardless of its analysis. Some plants, when operating without "premium" coal doubtless will lose pressure. But plants equipped with Stowe Stokers will be able to continue operations at high rating and efficiency with whatever coals are available.

Due to their unique grate construction Stowe Stokers are not dependent upon any type or analysis of coal. They can burn the entire range of bituminous coals from 20% ash low fusing coal to 4% ash West Virginia coal,—all at high rating and high efficiency. Changes of coal can be made without taking the boilers off the line. Coal storage can be reduced.

Our recently completed catalog gives full details about Stowe Stokers—furnished in sizes from 300 H. P. upward—and contains much information of interest to every engineer and operating man . . . Send for a copy today.

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DETROIT 878 Addison Road CLEVELAND, OHIO CHICAGO

Engineering and Sales Representatives in
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# STOWE STOKER

NOT AN UNDERFEED NOT A CHAIN GRATE

# *Complete protection*

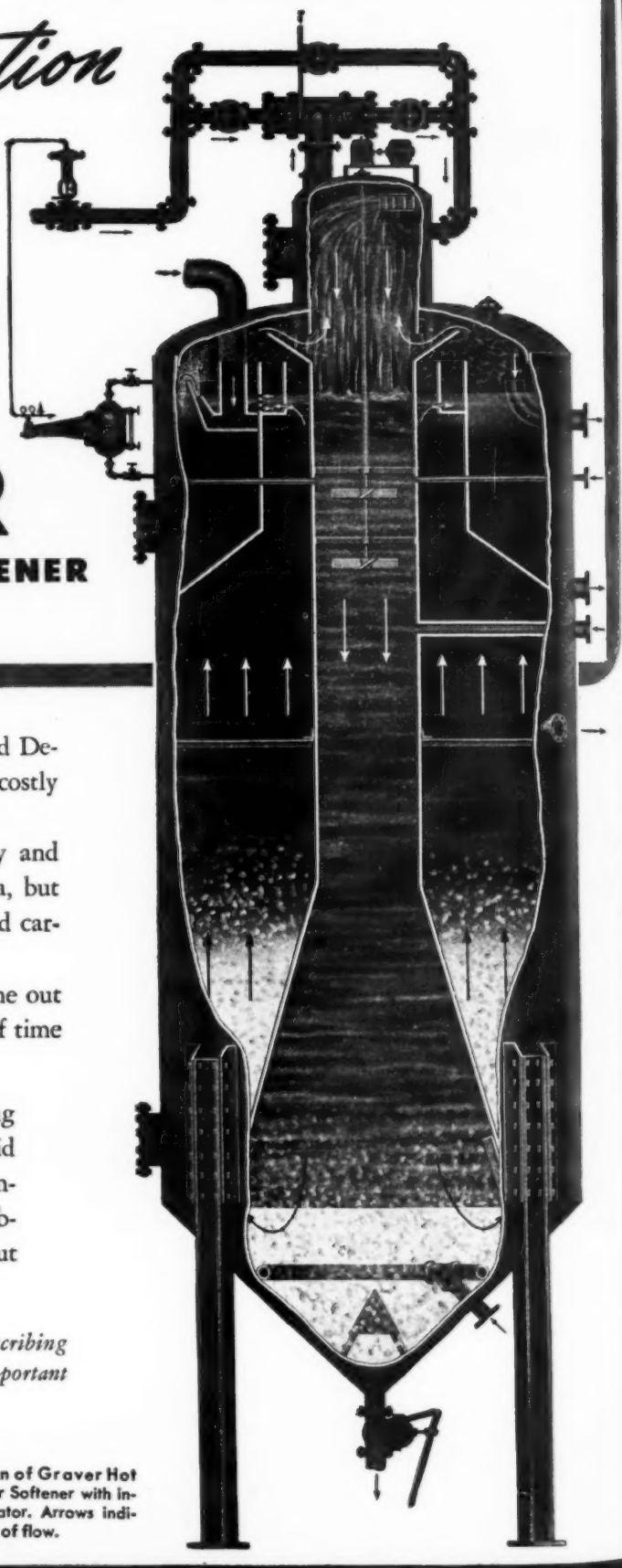
**AGAINST**

# BOILER CORROSION

**WITH**

# GRAVER

**HOT PROCESS WATER SOFTENER and DEAERATOR**



With the Graver Hot Process Water Softener and Deaerator, complete protection against delays and costly repairs, due to scale and corrosion, is afforded.

This equipment not only removes temporary and permanent hardness, suspended solids, and silica, but eliminates all such corrosive gases as oxygen and carbon dioxide.

Result—year 'round boiler service with no time out for scale removal and repairs—a definite saving of time and money.

Graver designs and builds water conditioning equipment of all types to meet the most rigid requirements. Whatever your problem, consult Graver. Our engineers will gladly submit recommendations and estimates without obligation.

*Write for 24-page bulletin No. 314 completely describing Graver Hot Process Water Softeners and containing important charts and diagrams.*

**Cross-section of Graver Hot Process Water Softener with internal Deaerator. Arrows indicate direction of flow.**

GRAVER

GRAVER TANK & MFG. CO., INC.

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4809-25 TOD AVE.
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CABLE ADDRESS — GRATANK

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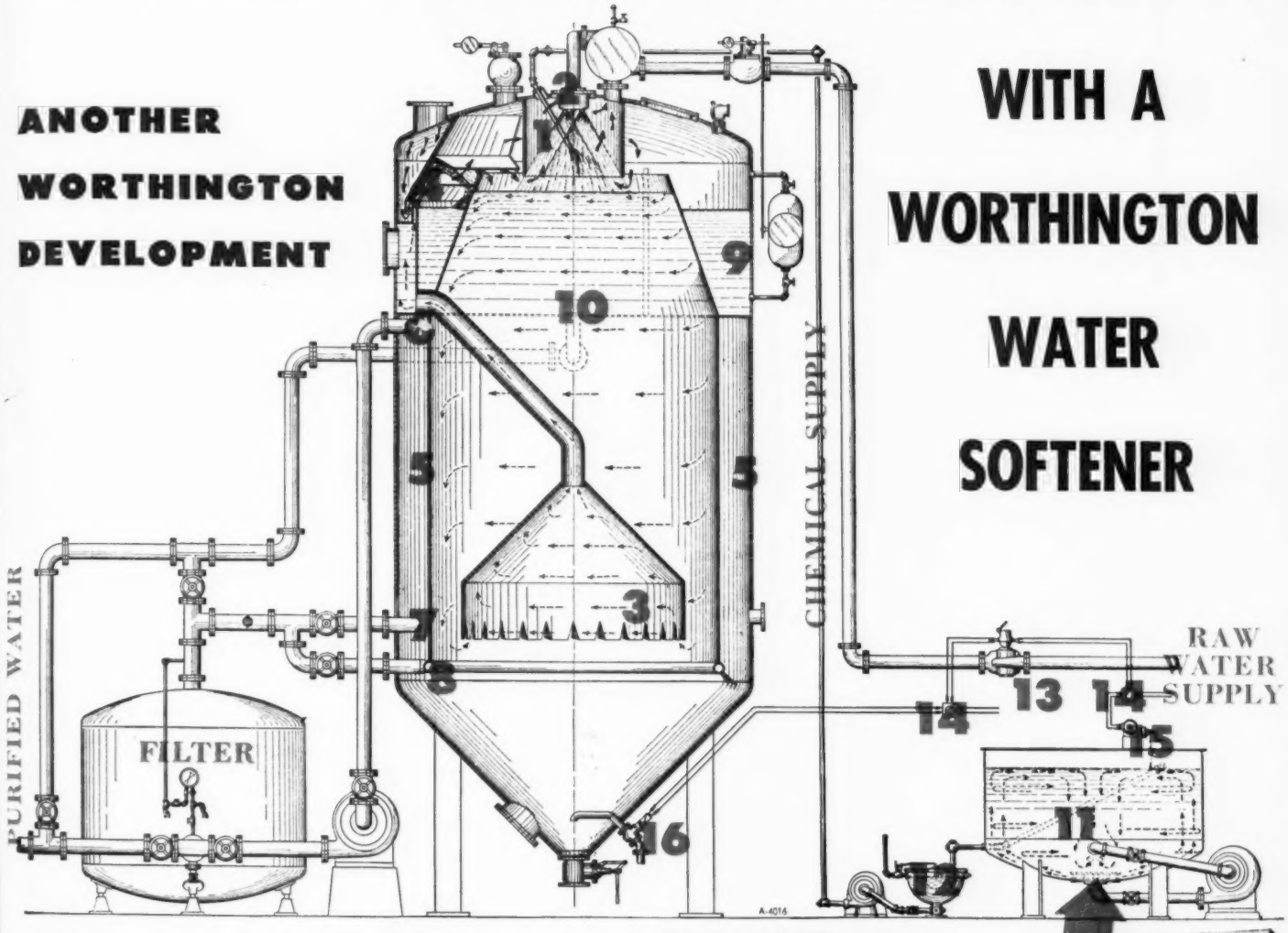
# MAINTAIN *Uniform* WATER TREATING RESULTS

## ANOTHER WORTHINGTON DEVELOPMENT

## WITH A WORTHINGTON WATER SOFTENER




## *Check these features!*

1. Primary Heater. Non-scaling. Efficiently heats the raw water and provides rotary mixing of water and chemicals.
2. Chemical Applicator. Removable. Sprays chemical through steam. Facilitates mixing and reaction.
3. Up-take Cone. Baffled serrations assure even draught. Increases softener capacity.
4. Deaerating Heater. Simple. Effective. Self-adjusting. No moving parts.
5. Wash Water Compartment. Backwashing operation separate from softening process. Disturbance of softening process by filter washing operation is avoided, permitting *uniformly* continuous operation.
6. Supply to Filter Wash Pump Suction.
7. Discharge of Dirt Laden Wash Water. Reclaimed by settling clear within 1½ hours.
8. Cleansing Ring. Provides uniform distribution of jets for washing softener precipitate and wash water sediment to central area of conical bottom.
9. Storage for Treated and Deaerated Water.
10. Treated and Deaerated Water Outlet to filters or direct to boiler feed pumps.
11. Chemical Agitator. (See above at right).
12. Chemical Dilution and Pump Suction Tank.

### NOTE THE EXCLUSIVE CHEMICAL SUPPLY AGITATING SYSTEM

Circulation of liquid chemical supply through *stationary* diffuser maintains uniform chemical strength without use of moving parts within tank.

The value of this superior feature is indicated by the *uniform* quality of the treated water.

13. Proportioning Meter. Accurate. Low loss. Equipped with totalizing register.
14. Relays. Adjustable time interval.
15. Decanting Mechanism. Sturdy. Reliable. Accurate.
16. Sludge Remover. Removes sludge in proportion to its rate of formation.

***For full details Bulletin W-212-B2 is available at district offices (in all principal cities) or at headquarters.***

WS3-1

**WORTHINGTON**

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.

# Helping America

## TO BURN COAL EFFICIENTLY AND ECONOMICALLY . .

## AMERICAN "AC" Type ROLLING RING CRUSHER

The sizing of stoker coals is of great importance, particularly during these times. Furnishing properly sized coal helps industry to get more efficient results and economy in costs.

You can size stoker coals and produce large tonnages daily to help meet today's great demand with the AMERICAN Rolling Ring Crusher. In one operation run-of-mine or lump coal is reduced to sizes for unit pulverizers and automatic stokers through the splitting action of these crushers.

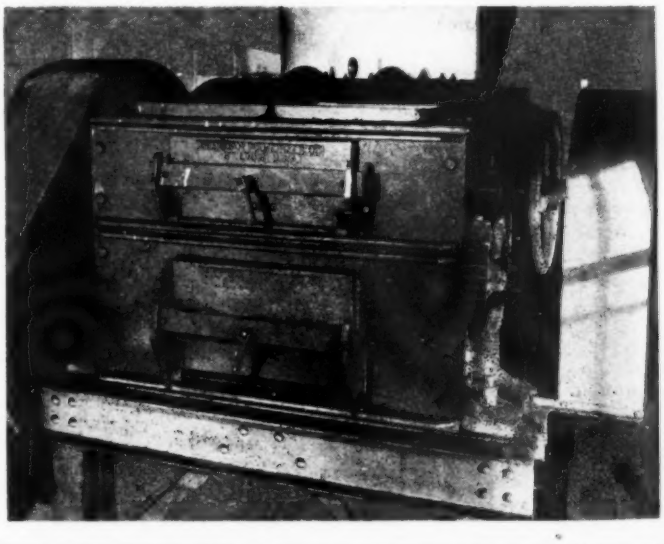
The AMERICAN Rolling Ring Crusher is designed for simplicity of operation and freedom from breakdowns. Tramp metal is passed without injury to the crusher. The flexibility of the rolling Ring System protects the machine from foreign material.

You can crush coal to stoker size at a total cost of less than one cent per ton, including maintenance, power, labor, depreciation, and interest on investment. Each crusher is sold on a definite guaranteed performance basis.

●

The splitting action of the SHREDDER RINGS shatters and distributes the coal before it reaches the Breaker and Grinding Plates.

These patented reversible manganese steel SHREDDER RINGS are found only in the American Rolling Ring Crusher. They have twenty cutting edges or teeth and are designed to maintain their outward position by centrifugal force at the specified speeds. In contact with solid metal, the rings are momentarily deflected from their usual course because they are free to swing back out of position. There are no shear pins or other safety devices that require attention.



**AMERICAN PULVERIZER COMPANY** 1349 MACKLIND AVENUE ST. LOUIS, MISSOURI

ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

# New Know-How Containers for Dixon's Graphites

## TICONDEROGA No. 1, No. 2 and No. 635

TWO panels of actual use-pictures of power plant and shop applications with attached folding 7-page descriptive booklet, offer many and varied know-how-to-use directions and suggestions which will prove very helpful to even the most experienced users of Dixon Graphites.

### THE EXCELLENCE OF THESE GRAPHITES REMAINS UNCHANGED

In their new instructive packages, these graphites will continue to provide in even wider scope, distinctive service values in reducing FRICTION and OVERHEATING attending EXTREME BEARING PRESSURES and HIGHER SPEEDS and for COATING GASKETED, THREADED and FLANGED PIPE JOINTS and in many other similar and widely different services.

• • •

THE NEW KNOW-HOW PACKAGE IS NOW AVAILABLE *ONLY* IN THE FOLLOWING SIZES

5 & 10 LB. TICONDEROGA NO. 1 (LARGE FLAKES)
5 & 10 LB. TICONDEROGA NO. 2 (MEDIUM POWDERED FLAKES)
5 LB. NO. 635 (FINELY POWDERED FLAKES)

All other size containers of these Graphites including MICROFYNE (extra finely powdered flakes), are still being packed in the previous style packages, which will be changed as soon as new containers are obtainable.

**JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY, N. J.**

Pipe Joint Compound • Graphite Seal • Graphited Oils • Cup and Pressure Gun Grease • Gear Lubricants • Waterproof Graphited Grease • Auto-Marine Grease • Graph-Air Guns • Lathe Center Graphite Lubricant • Belt Dressing (Contains no Graphite).

3693

*Official U. S. Navy Photo*

# U. S. NAVY'S Seabees learn REFRIGERATION

THE official U. S. Navy photo above shows a refrigeration class at the Naval Construction Training Center near Norfolk, Virginia. Training of refrigeration specialists is greatly facilitated by the visual demonstrator of the refrigeration cycle.

The Seabees shown are following the instructions of Chief Shipfitter W. A. Edwards, who is pointing to the "mock-up" of the Carrier circuit. All men selected from Seabee battalions for special training in operation and maintenance of refrigeration equipment have been previously enlisted and rated on the basis of their civilian experience in the mechanical refrigeration field.

Carrier refrigeration and air conditioning first went to war in World War I. Today, the control of air temperature, humidity and circulation of cleaned air is provided by Carrier equipment and technique for Army camps, Navy bases and war production.

Users of Carrier equipment will find their nearby Carrier Branch Office or distributor ready to cooperate in every way to help keep present equipment operating efficiently and economically for the duration. Mail the coupon for a copy of the helpful booklet: "Civilian Conservation of the B.T.U."

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CARRIER CORPORATION, Syracuse, N. Y.

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Desk 53 E
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Please send copy of booklet "Civilian Conservation of the B.T.U.," telling how to keep air conditioning and refrigeration equipment operating for the duration.

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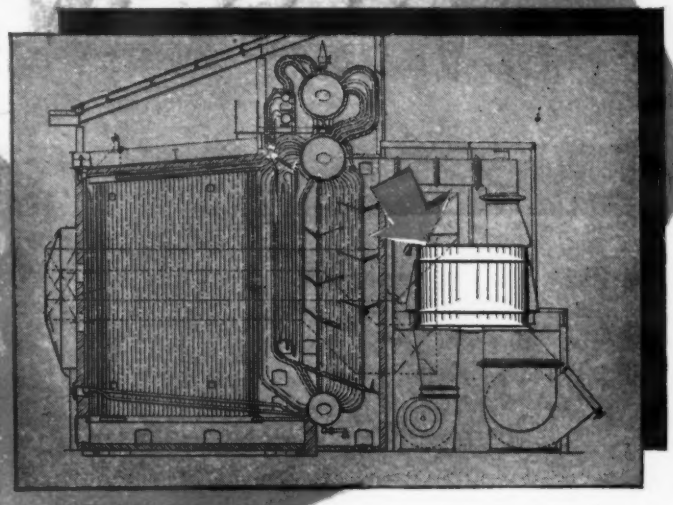
*This most coveted honor, the Army-Navy "E", was awarded to Carrier Corporation for continued excellence in war production.*

**Carrier**

AIR CONDITIONING
REFRIGERATION

# BOOSTING THE OUTPUT for meat packing plants



Ljungstrom Air Preheaters help mid-western central station fill packers' power and steam demands

*During 1942, two of these Ljungstrom-equipped steam generating units were on the line 97% of the time . . . and their availability was over 98%. Fired by natural gas, each unit has a continuous capacity of 200,000 lb. steam per hr. Flue gases enter the preheater at 700° F., leave at 350° F., heating incoming air to 560° F., as an aid to efficient combustion. Heat recovery in the preheater is a significant factor in holding efficiency at 82.9%, which meets the design estimate for natural gas firing.*

. . . . .

Food packing plants...synthetic rubber plants... munitions manufacture . . . wherever the war is forcing steam generation to the limit, Ljungstrom Air Preheaters are establishing highly favorable records of practical, full-time performance.

These *service* advantages are over and above the initial *engineering* advantages of the Ljungstrom: its saving of steel, its conservation of space, and the extra efficiency of its *continuance regenerative counterflow* principle.

These highly flexible gas-to-air heat transfer units are now finding application in many processing operations outside the field of steam generation, as on oil heating furnaces. For facts and figures, write:

**THE**

# AIR PREHEATER

**CORPORATION**

**Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York**

# Installation of Super Refractory Brick in Various Types of Boiler Furnaces

The drawings and explanation below are based upon recent installations of Crystolon (Silicon Carbide) brick in boiler furnaces. Results have been completely satisfactory when the directions given here were followed.

Crystolon brick are proving satisfactory for today's war-time need of uninterrupted peak operation. Produced at high temperatures these brick are particularly resistant to extreme heat. Their hardness makes them resistant to the abrasive action of ash and the motion of the fire bed.

The surfaces of Crystolon brick are sufficiently dense to prevent molten ash from taking hold by penetration and this same density enables them to resist the erosive action of slag.

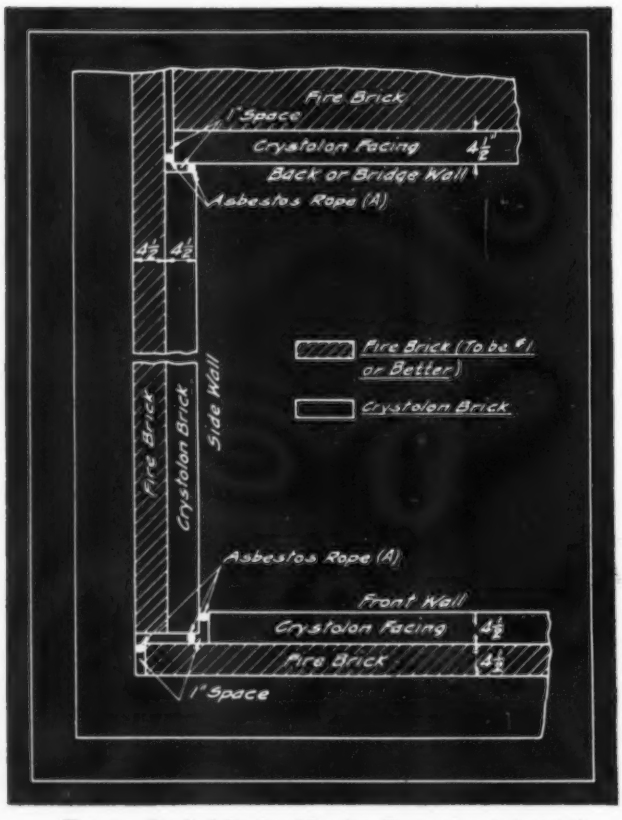



FIG. 1 *Typical Setting Showing Expansion Joints (A)*

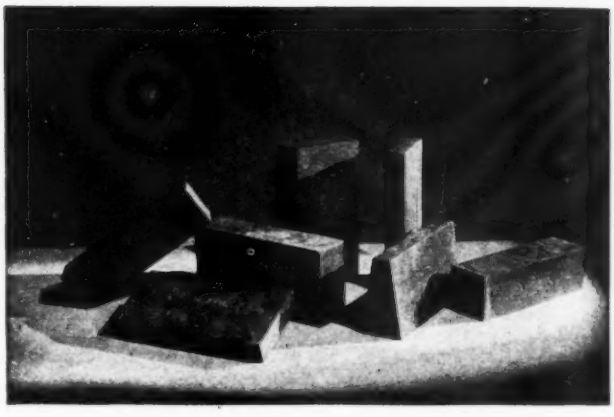


FIG. 2 *Crystolon Brick for Boiler Furnaces*

Other types of refractory brick often necessitate shutdowns or down-time to remove the clinker. While the clinker may sometimes adhere to Crystolon brick to a limited extent, these brick are sufficiently rugged to withstand the rather rough barring action that is commonly used to knock off the clinker.

Super refractory brick although costlier than ordinary fire brick actually give more economical service through reduced maintenance time and longer life.

It is advisable to use the same construction in the bridge wall as is shown (Fig. 1) for the side wall when Crystolon brick are used.

In cases where it may not be convenient to put in expansion joints as shown (see A, Fig. 1), expan-

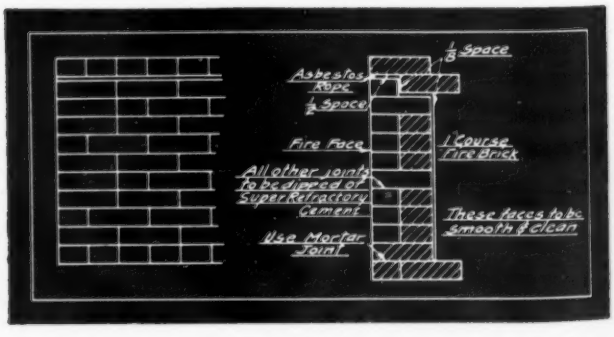

⅛" Space
Asbestos Rope
½" Space
Fire Face
1 Course Fire Brick
All other joints to be dipped of Super Refractory Cement
These faces to be smooth & clean
Use Mortar Joint

FIG. 3 *Construction Using from 9 Courses up to 4½' of Crystolon Brick*

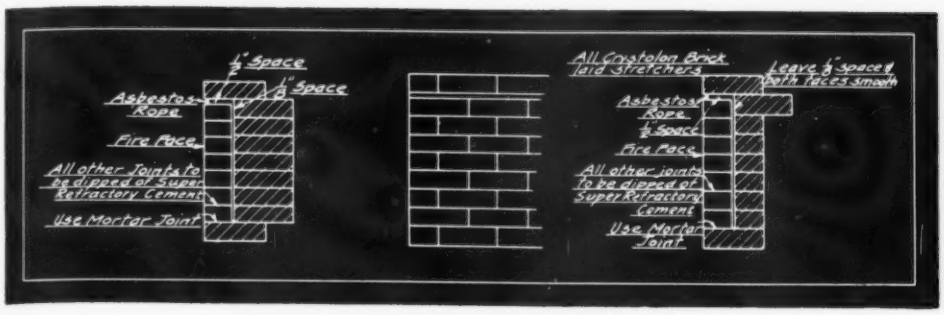

½" Space
¼" Space
Asbestos Rope
Fire Face
All other Joints to be dipped of Super Refractory Cement
Use Mortar Joint
All Crystolon Brick laid Stretchers
Leave ½" Space & both faces smooth
Asbestos Rope
½" Space
Fire Face
All other joints to be dipped of Super Refractory Cement
Use Mortar Joint

FIG. 4 *New Construction (left) and Repairing Old Construction (right) Where 7 Courses or Less Are Used*

sion can be taken care of by leaving $\frac{1}{16}$" to $\frac{1}{8}$" open joint between each brick in the stretcher courses or every second brick in a header course. In any case, expansion allowances must be made. A good rule to use is approximately $\frac{1}{8}$" expansion to 15" of Crystolon brick in the wall.

For best results, not less than five courses of Crystolon brick should be used in any boiler furnace except in cases where exceptionally thin fire beds are carried and peculiar conditions of operation might justify the use of fewer courses.

In general, five to nine courses are used depending on the type of stoker, size of furnace, thickness of fuel bed carried and rating at which boiler is to be operated. If too few courses are used, there is danger of a slag curtain building down from the fire brick above and interfering with the efficiency of the Crystolon brick.

Always use a super refractory cement* for laying up the Crystolon brick. A dipped joint is best in laying Crystolon brick, unless otherwise specified. The brick should be hammered down tightly to make as nearly a face-to-face joint as possible. *Do not use ordinary fire clay or fire brick cements nor any of the groups known as air-setting or air-hardening cements in contact with the Crystolon brick.*

*Send for Norton Refractory catalogs: Cement No. 863-Crystolon Brick No. 862.

In the center retort, side-dump type of stoker the Crystolon brick should be started 3" below the nose of the dump plate.

In the multiple retort type of underfeed stoker the Crystolon brick should start at the grate line and follow the slope of the stoker, using a few more courses of Crystolon brick in the side wall toward the rear of the stoker. It is well to use standard jamb or bull nose and arch brick to build around the rear inspection door.

In the chain grate type of stoker the Crystolon brick should be laid directly on the side wall bed plate or in any case should start slightly below the top of the chain grate. In the case of one type of Cox stoker now in use a special Crystolon brick is employed with a $\frac{1}{2}$" cut-out which fits directly over the side wall plate.

In hand-fired boiler furnaces it is common practice to start the Crystolon brick an inch or two above the top of the grate.

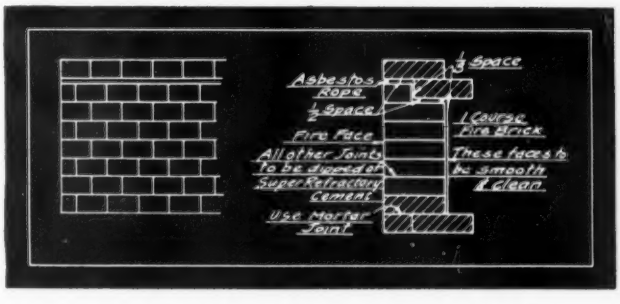

½ Space
Asbestos Rope
½ Space
1 Course Fire Brick
Fire Face
All other Joints to be dipped of Super Refractory Cement
These faces to be smooth & clean
Use Mortar Joint

FIG. 5 *Construction Using 9" Crystolon Wall All Headers up to 4' in Height*

NORTON ELECTRIC FURNACE FUSED REFRACTORIES

# The corset does it

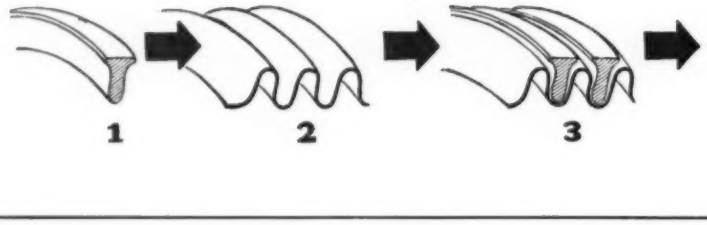
IT KEEPS things in place. That's what the "corset"-like *ALL-CURVE* equalizing ring (1) does to prevent overstrains and lengthen the life of the Badger Self-Equalizing Expansion Joint. Here's how it works:

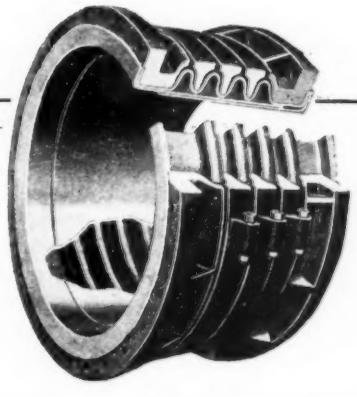
The corrugations of the Badger joint have no straight sides and no "junctions" to localize stresses. The *ALL-CURVE* corrugation (2) enables stresses to be distributed evenly. When compressed, the *ALL-CURVE* equalizing ring fits into the corrugations "snug as a corset" (3) and not only limits the flexing but *controls it progressively*.

No wonder Badger Self-Equalizing Joints are so dependable and last so much longer than old-type joints! A further feature toward durability is the "conditioning" given the copper in Badger Expansion Joints. Through scientific heat-treatment during fabrication, Badger has found a way to make it retain its flexing characteristics under long and strenuous service.

• • •

COPPER for pressures up to 200 pounds and temperatures up to 500° F. Badger also makes STAINLESS STEEL for the higher pressures and temperatures and for extra corrosion resistance. (Badger was the first to develop the practical application of Stainless Steel to the corrugated expansion joint.)



***NON-EQUALIZING (packless) EXPANSION JOINTS*** also are made by Badger, in Copper or Stainless Steel, for lines where pressures do not exceed 25 pounds and traverses not exceeding ½". Also used to absorb strains, vibrations and distortions between connecting equipment. Bulletin 200.

IF IT'S **BADGER**-MADE IT'S **GOT SOMETHING!**

**E. B. Badger & SONS CO.**

**75 PITTS STREET, BOSTON, MASS.**

*AGENTS IN PRINCIPAL CITIES*

**BADGER CORRUGATED EXPANSION JOINTS**

## FURNACE CONSTRUCTION for WARTIME SERVICE

Ten years ago the arch shown in this photograph was built to prove that the Detred Tile design was right. Notice the spalls in the upper section which was made in the old style Detrick tile showing the effect of severe furnace conditions. In the same arch the Detred area is practically as smooth and tight as the day it was erected.

It was a simple, logical step to put treads on all four sides of the tile and an inspiration to reverse the treads at intervals so that the tile is held in position in two directions. The waffle-like bond is held in position by the treads and thus adds to the airtightness.

No change has been made in the basic Detred Tile design in the past ten years and it is in use in thousands of furnaces on walls and arches helping to provide power and conserve heat for the war effort.

Every one of Detrick's construction principles has come as the result of trying to lick some particular problem in the control or conservation of heat. In 30 years of concentrating on this subject many hundreds of examples of practical engineering have been developed. Detred Tile is only one of them.

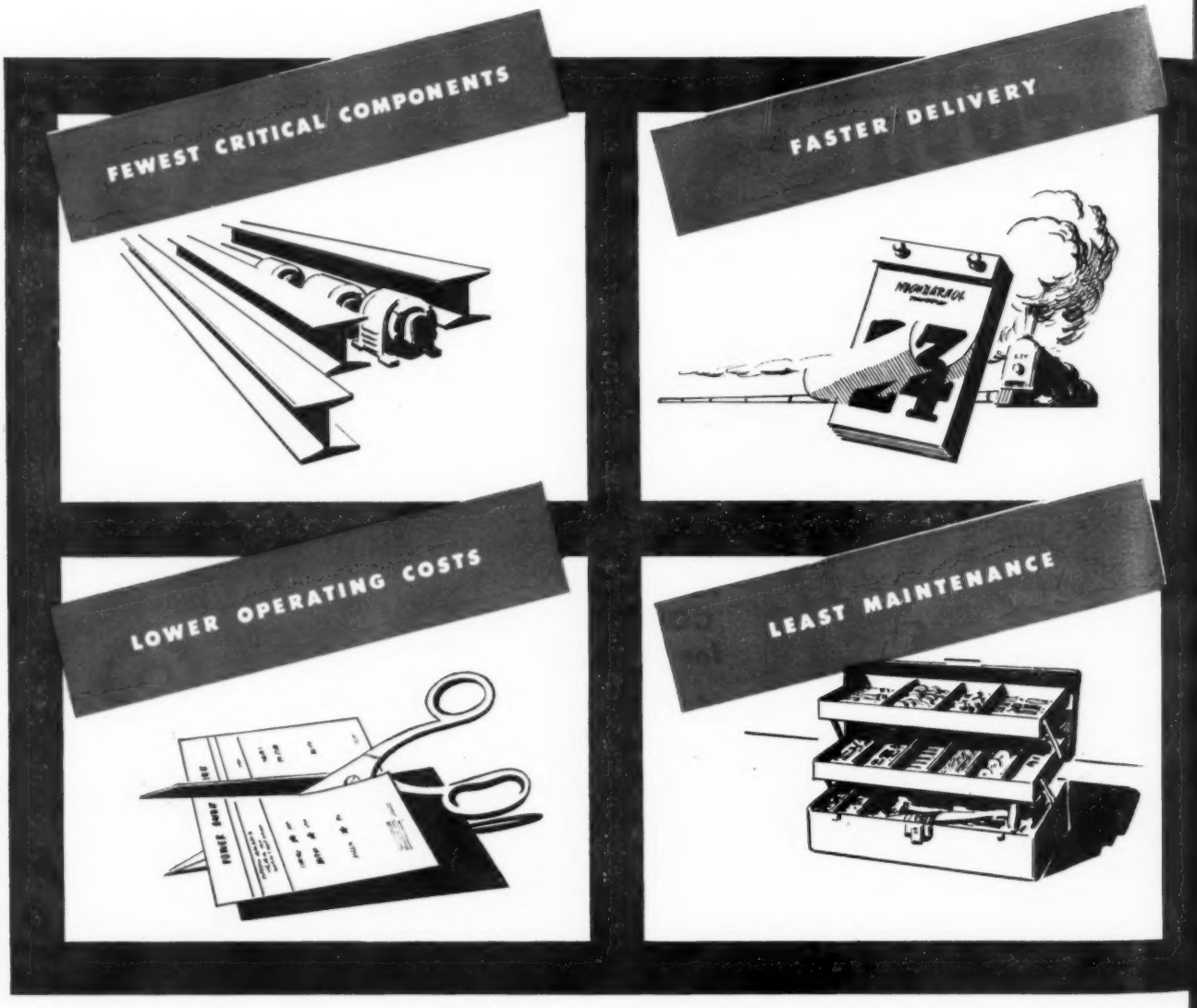
When you have a problem in enclosing heat, call on Detrick. You will find them a closely knit organization of practical men, every one equipped with a background of experience on this subject . . . ready and willing to help you find the simplest answer to any refractory furnace problem you may have. Ask for the new Detrick Catalog just off the press.

**M. H. DETRICK COMPANY**

**140 South Dearborn Street** **Chicago, Illinois**

# DETRICK FURNACE ENCLOSURES

# Today *these 4 fundamental facts dictate the specification of* Atmospheric Aerator Type Cooling Towers




FLUOR BUILDS both Atmospheric Type Cooling Towers and Mechanical Draft Cooling Towers. To those concerned with the specification of a cooling tower, Fluor is ably qualified to give unbiased counsel in the selection of the type of tower best suited for cooling process water, for any service, in any location, in any quantity.

Fluor believes that today, *under War conditions,* the specification of an Atmospheric Aerator Type Cooling Tower is dictated by the following four fundamental facts which make substantial contributions to the war effort.

**Fact No. 1.** An Atmospheric Aerator Cooling Tower us fewest critical components. Your specification of an atmo pheric tower means that steel, brass, aluminum, motors, fan gears, switches, conduit and other hard-to-get materials, esse tial to the Mechanical Draft Types, are released for critic armament uses, as are the thousands of man-hours requir for their manufacture, assembly and shipment.

**Fact No. 2.** An Atmospheric Aerator Cooling Tower can b delivered faster, — often three times quicker than towers the Mechanical Draft Type. Because the production of critic

components for Mechanical Draft Towers is wholly or in greater part in the hands of sub-manufacturers; the final delivery of a Mechanical Draft Type is dependent on these sub-manufacturers. On the other hand, the manufacture of an Atmospheric Aerator Type Cooling Tower is controlled by Fluor. Throughout the whole defense and war program Fluor has never failed to meet or beat scheduled delivery dates. This record will continue; Fluor is geared to do it.

**Fact No. 3.** An Atmospheric Aerator Cooling Tower costs less to operate, because it requires least horsepower. There are no fan motors to operate. Here again, power, essential to war industries, is conserved to relieve the power shortage.

**Fact No. 4.** In an Atmospheric Type Tower, maintenance costs are negligible. Mechanical devices, such as motors, gears and fans, in a Mechanical Draft Type Tower require attention, – entail costs in both operation and upkeep. Maintenance like this and the man-power attendant to it, are eliminated with the specification of an Atmospheric Aerator Cooling Tower.

On the basis of the above four facts, the only limiting factors making the specification of Mechanical Draft Towers mandatory are (1) lack of space for the erection of the Atmospheric Type and (2) extremely subnormal wind conditions. You may ask, "How can we be certain that a Fluor Atmospheric Aerator Cooling Tower is the absolute correct specification under any conditions?"

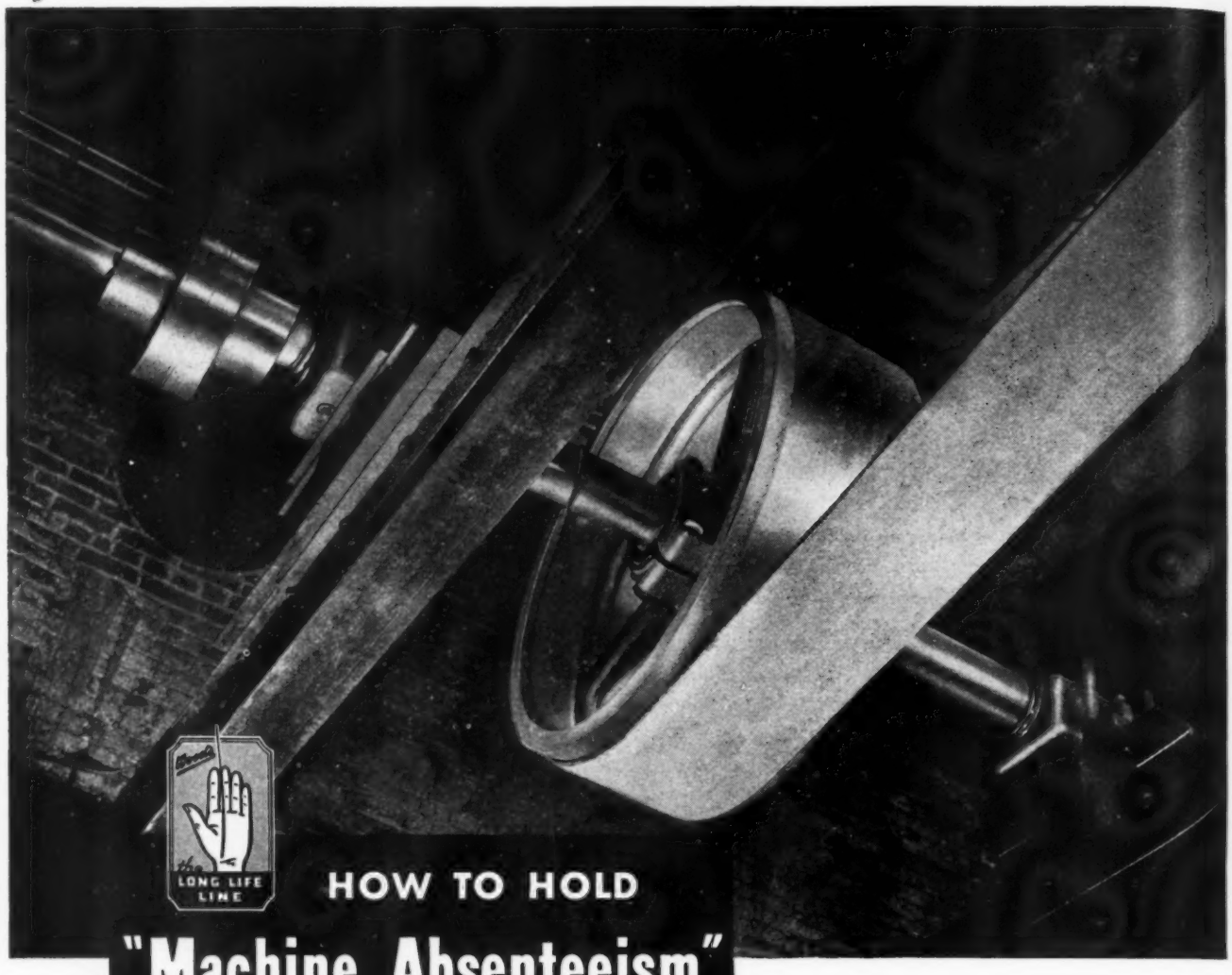
Fluor Engineers will gladly give specific, unbiased answers to this question after analysis of your problem. Since Fluor makes all types of cooling towers our thinking is completely independent. If analysis shows that the Mechanical Draft Type Tower is the answer to your problem, Fluor will cooperate by furnishing expert documentary evidence of essential need as a means of assisting you in obtaining the necessary directive.

These, then, are the facts why Fluor recommends your specification of Atmospheric Aerator Type Cooling Towers for the duration. Wire or airmail your inquiry for prompt action. *Be Sure with Fluor.*

**COOLING TOWER DIVISION OF THE FLUOR CORPORATION LTD.**

2500 So. Atlantic Blvd., Los Angeles, Calif.

NEW YORK, N.Y. • PITTSBURGH, PA. • KANSAS CITY, MO. • HOUSTON, TEXAS




# HOW TO HOLD "Machine Absenteeism" TO A MINIMUM

Through four wars—and four-score years of peace—our primary stock in trade has been good engineering . . . the design, manufacture and installation of power transmission devices that assure our customers of long-lived, power-thrifty and completely satisfactory *performance*. Let us show you how WOOD'S engineering experience holds "machine absenteeism" to a minimum. Write us today.

T. B. Wood's SONS COMPANY
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Bearings · Collars · Clutches · Couplings · Contactors
Hangers · Pillow Blocks · Pulleys · V-Belt Sheaves
and Complete Drives

**BRANCH OFFICES**
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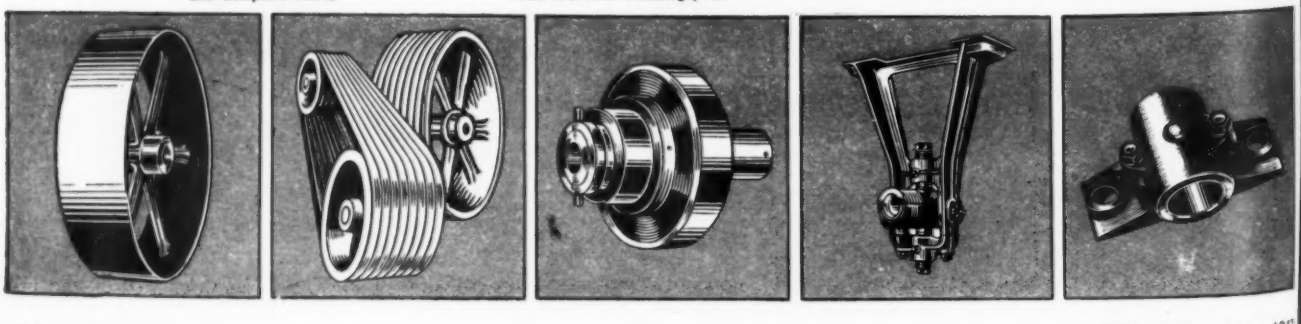
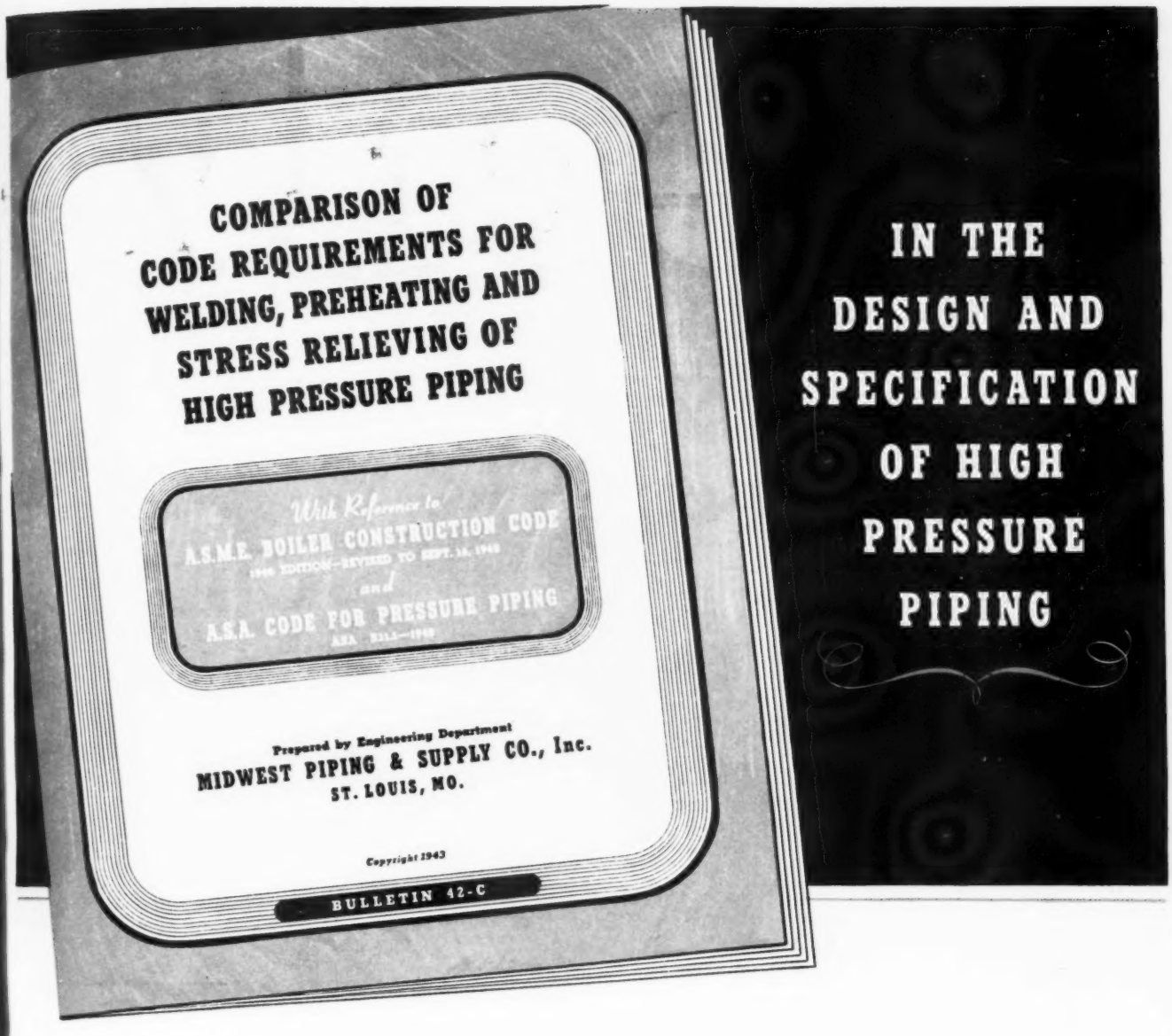





# THIS *NEW BULLETIN* SAVES TIME AND AVOIDS POSSIBLE CONFUSION

**MIDWEST**
**PIPING & SUPPLY CO., Inc.**

Main Office: 1450 South Second St., St. Louis, Mo.
Plants: St. Louis, Passaic (N. J.) and Los Angeles

Sales Offices: Chicago—645 Marquette Bldg. • Houston—229 Shell Bldg. • Los Angeles—520 Anderson St. • New York—(Eastern Division) 30 Church St. • Tulsa—535 Mayo Bldg.

**Many engineers and others concerned with the design, specification and installation of pressure piping (for steam, boiler feed and blow-off) will find this new Midwest Bulletin helpful. It is a concise and handy comparison that emphasizes the differences in piping requirements of the ASME Boiler Code and the recently revised ASA Code for Pressure Piping.**

**We shall be glad to send a copy to anyone interested who will write the nearest Midwest office on his company letterhead. There is no obligation. Ask for Bulletin 42-C.**

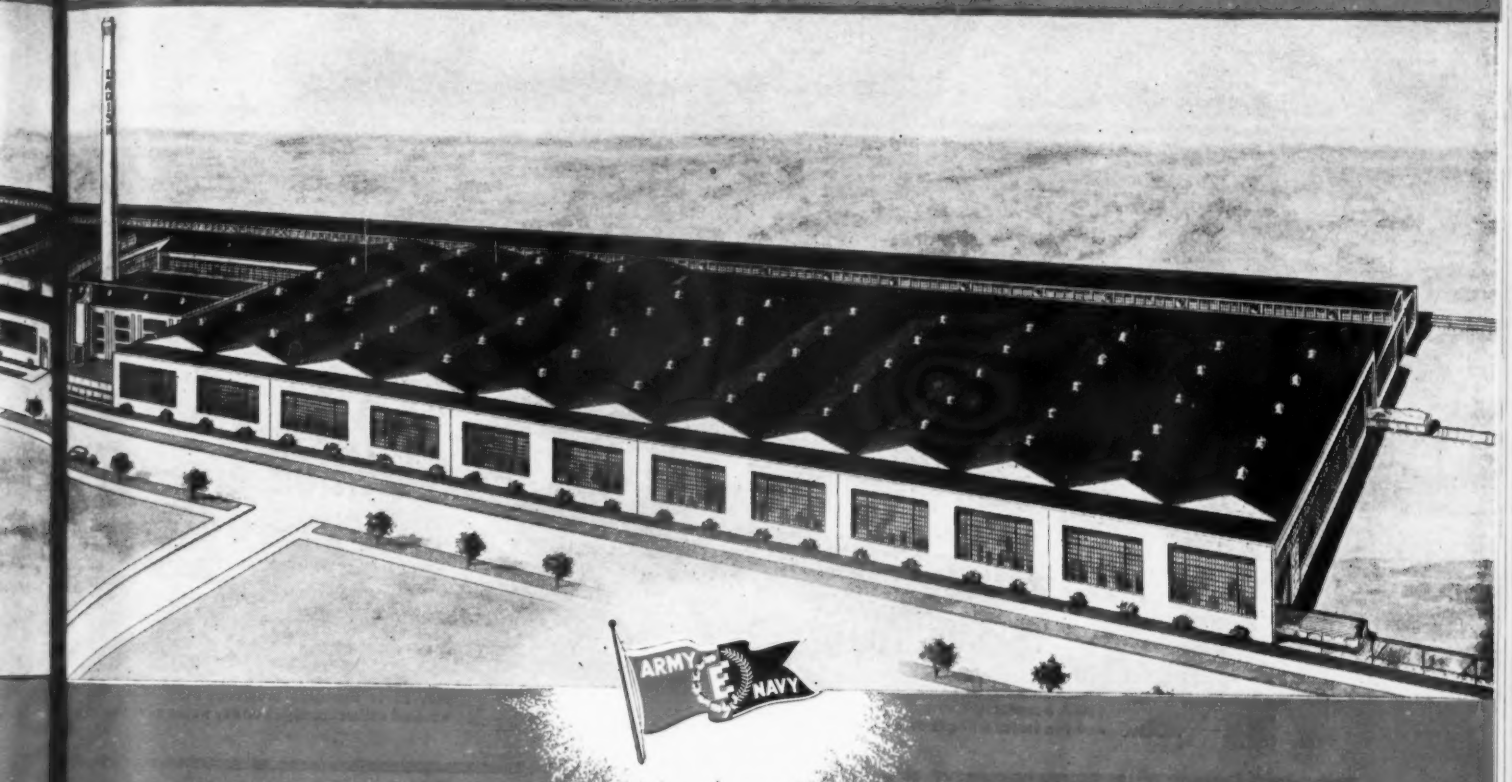
# Effective

L

TO MARK PROGRESS

FLANGE DIVISION . . .

# July 15th




After approximately ten years of marketing its forged steel flanges through one exclusive sales organization, AMERICA'S LARGEST PRODUCER OF FORGED STEEL FLANGES will sell through its own sales and distributing organization, beginning July 15, 1943.

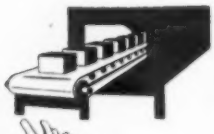
●

DISTRIBUTORS . . . Limited territories will be available.

## LADISH DROP FORGE CO.

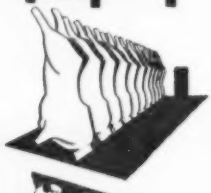
PLANT AND GENERAL OFFICES: CUDAHY, WISCONSIN

MILWAUKEE SUBURB



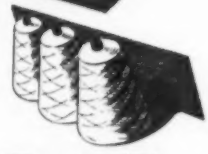
## HIGH TEMPERATURE

The bearings on conveyors running through heat treating kilns were a real problem to lubricate. LUBRIPLATE No. 320 does an outstanding job.



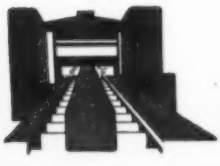
## LOW TEMPERATURE

Refrigerator room equipment is subjected to cold and condensation. LUBRIPLATE No. 105-V gives perfect lubrication to 40° below zero.



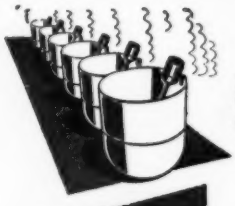
## HIGH SPEEDS

Wood Working and Textile Spindle speeds were limited by lubrication. LUBRIPLATE No. 1 has made the desired high speeds possible.



## HEAVY LOADS

The high film strength of LUBRIPLATE No. 130-A permits rolling mills to use more pressure and run faster without damage to bearings.



## STEAM and CHEMICALS

Food Packers whose machines must be scrubbed with scalding water find LUBRIPLATE No. 107 doesn't wash off nor is it affected by food acids.

## BALL BEARINGS

Reports from every industry show that LUBRIPLATE BALL BEARING Lubricant increases the life of bearings and keeps them running cool.

## PRECISION BEARINGS

Minimized "drag" and the fact that LUBRIPLATE No. 105-V prevents rust has caused its adoption by numerous instrument makers.

## UNDER WATER

A dredging company tells us that LUBRIPLATE No. 25 is the only lubricant they found that worked satisfactorily in under water gear boxes.

# *EVERY PLANT NEEDS* LUBRIPLATE

We need more guns . . . we need more planes . . . we need more food . . . we need more of everything to win this war.

Proper lubrication, therefore, is the number one essential in every plant. That is why LUBRIPLATE lubricants are so widely used today. In addition to giving better lubrication, LUBRIPLATE prevents rust and corrosion even in the presence of many acids. It withstands water and doesn't "wash out" of bearings. The enormous film strength of LUBRIPLATE permits heavier loads on bearings, yet it will not cause drag in the most delicate instrument.

LUBRIPLATE lubricants are manufactured in various fluid and non-fluid densities to meet every condition. They are packed in containers from one to five hundred pounds.

Send for a copy of "The LUBRIPLATE Film". It tells what LUBRIPLATE is doing in your industry.

## LUBRIPLATE DIVISION

**FISKE BROTHERS REFINING COMPANY**

NEWARK, N. J. **SINCE 1870** TOLEDO, O.

WRITE FOR THE NAME OF THE DEALER NEAR YOU

# WHY "RIGHT-NOW" IS THE TIME TO TIMKENIZE

War production requirements have given great stimulus to improvements in machine design.

This trend not only affects fighting equipment, but also every kind of industrial machine.

It will become even more pronounced during the reconstruction period following Victory.

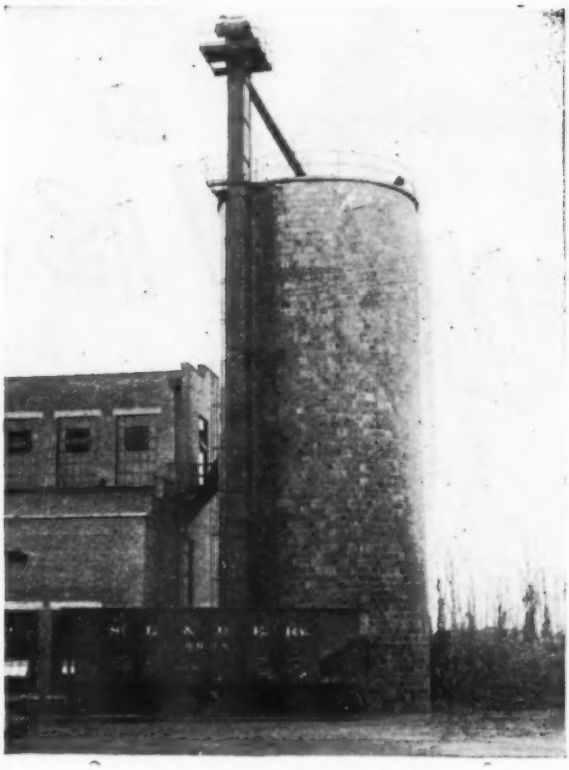
That's why it will pay you—*right now*—to redesign your product to include Timken Bearings at every possible point.

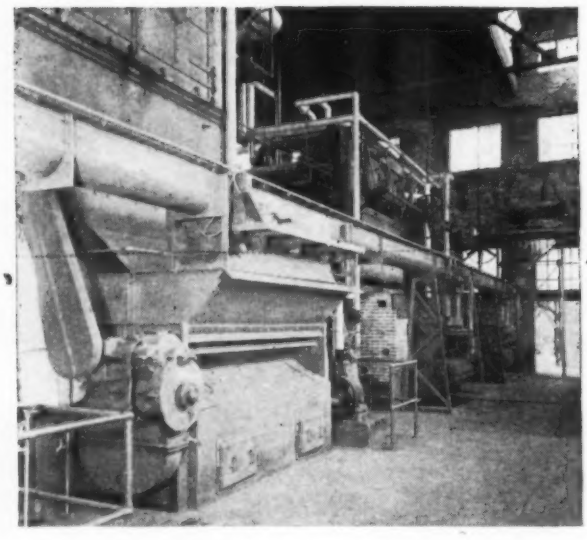
By doing so you will help the war effort; and furthermore you will be all prepared for the competitive post-war period with a better *performing* and a better *selling* product. "Timken Bearing Equipped" assures superiority to equipment buyers everywhere.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

**TIMKEN** *TAPERED ROLLER* **BEARINGS**

# FUEL OIL HAS GONE TO WAR





## COAL AGAIN BECOMES THE NATIONS MOST VALUABLE POWER AGENT

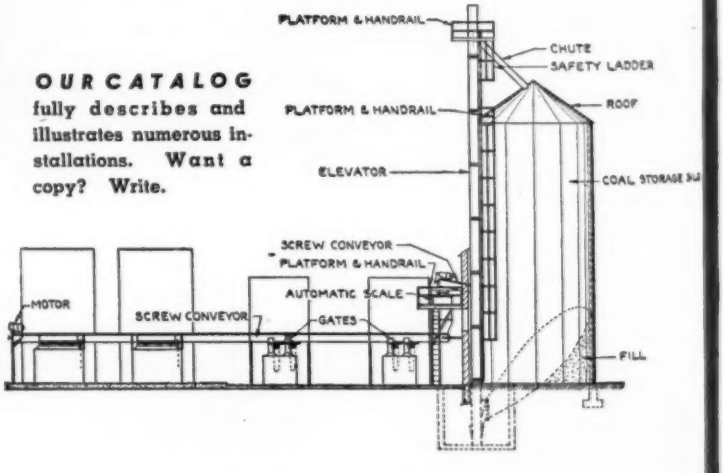
Perhaps you have been using other fuel and are proud of your clean modern plant. If so we have good news for you on your conversion problem.

Your plant can still be as clean as ever—you do not need to make costly changes in your present structures—you will not have to store your coal inside your plant—and the entire operation of coal handling is practically automatic.

## ALL THIS-WITH THE FAIRFIELD SILO SYSTEM

The silo is located outside your plant where it does not interfere with either light or ventilation. Storage of 100 to 500 tons requires a maximum diameter of only 24 feet. The coal is delivered to the Silo by a bucket elevator and to your stokers or pulverizers by either a weigh larry or conveyor. Thus there is no dirt inside your boiler house from coal dust.

***OUR CATALOG*** fully describes and illustrates numerous installations. Want a copy? Write.




***Fairfield*** can simplify your conversion problems—help you conserve coal—save money with this complete service. Fairfield will take full responsibility for erecting Silo and complete installation of equipment. Consult them on your conversion problems.

## THE FAIRFIELD ENGINEERING CO.,— MARION, OHIO

Aircraft Carriers and Destroyers use KELLOGG prefabricated High Pressure Piping

KELLOGG THE M. W. KELLOGG COMPANY
JERSEY CITY, N.J. · 225 BROADWAY, N.Y.
*Representatives:*
LOS ANGELES: 609 SOUTH GRAND · TULSA: PHILTOWER BLDG.

"Masterflex" Prefabricated Piping Systems · "Masterweld" pressure vessels for Power, Refinery and Chemical Industries. Heat Exchangers. Pyrolytic and Catalytic Cracking Units, Reforming, Dehydrogenation, Alkylation, Desulphurization. Thermal and Catalytic Polymerization Units · JUIK Processes for Lubricating Oil Plants. Plastic Refractories · Radial Brick Chimneys.

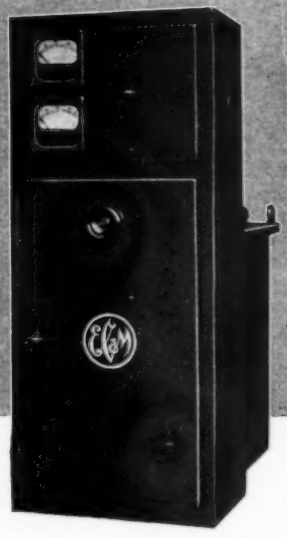
A complete line of 110-550 Volt

# Synchronous Starters

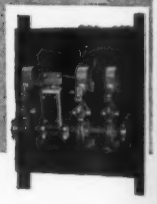
for general industrial service and for special applications, such as pipe-line duty, etc.

**OIL-IMMERSED, DEAD FRONT TYPE** with auto-transformer starter or full-voltage magnetic contactor in rear tank and automatic field-switching panel in front compartment. Available, when needed, with oil-immersed field-panel for Class 1, Group D Hazardous Locations.

**AIR-BREAK, OPEN OR ENCLOSED TYPE** with EC&M *LINE-ARC* Magnetic Contactors for main line and motor circuits. Reduced-voltage starters have auto-transformers mounted, with field-discharge resistors, on rear of panel (open type) or in bottom of cabinet (enclosed type).

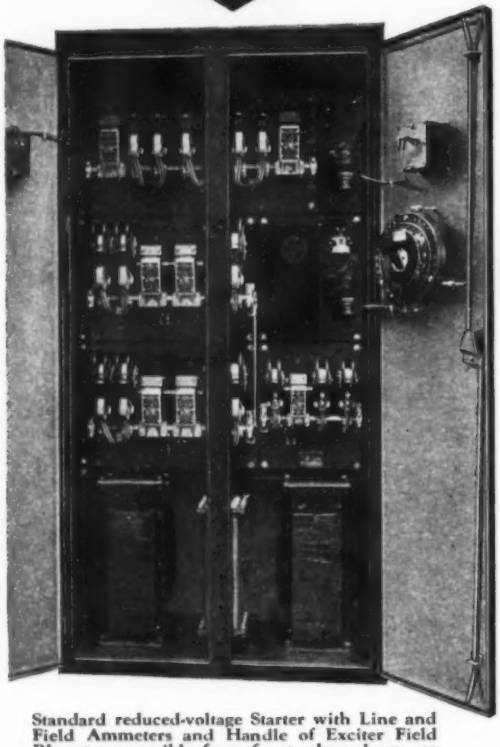


Automatic Compensator for reduced-voltage starting.



Magnetic Contactor for full-voltage starting.

Full Voltage (open type) Starter



Standard reduced-voltage Starter with Line and Field Ammeters and Handle of Exciter Field Rheostat accessible from front when doors are closed.

## BULLETIN 1076-A

**EC&M Air-Break Starters have these features:**

- Open style for Control Room mounting or with Enclosure suited to operating conditions.
- Two or three phase service for motors up to 400 HP, 220 volts or 800 HP, 440 and 550 volts.
- With Push Button self-contained or for separate mounting to provide remote control.

## BULLETIN 1075-A

**EC&M Oil-immersed Starters have these features:**

- Completely enclosed, compact unit for mounting alongside the motor or in a control room.
- Two or three phase service. Maximum ratings (reduced voltage) 150 HP, 220 volts and 300 HP, 440 and 550 volts—(full voltage) 400 HP, 220 volts and 800 HP, 440 and 550 volts.
- With self-contained "Start-Stop-Reset" switch or separately mounted Push Button.

**Both types of Starters have these standard features:**

- Automatic field application by quickly-adjustable, NEO-TIME (electronic type) Relay.
- Non-creeping, adjustable, magnetic Overload Relays.
- Field removal and automatic resynchronization (optional).

EC&M COMPLETELY AUTOMATIC — SYNCHRONOUS STARTERS

THE ELECTRIC CONTROLLER & MFG. CO., Cleveland, Ohio

THE ANCHOR PACKING CO.

Coils of various sizes are packed in metal cans containing approximately 5 lbs. each. Sizes 3/16" to 1¼"

CARBONITE Bulk No. 808 . . . Supplied in 1, 2, and 5 lb. cans.

# CARBONITE

***The World's Most Economical Plastic Packing***

A truly high pressure packing formed from No. 1 long fibre Canadian asbestos and pure flake graphite. Recommended for temperatures up to 900° F. on centrifugal, rotary or reciprocating shafts, expansion joints and valve stems . . . Supplied in coils of various sizes and bulk form for emergency purposes . . . There's a type to meet every range of service . . . Consult the nearest "Anchor" representative —he is an expert on packing and packing problems.

## THE ANCHOR PACKING COMPANY

***MANUFACTURERS—DISTRIBUTORS***

**METALLIC & FIBROUS PACKINGS FOR EVERY PURPOSE**

**GENERAL OFFICES**

**PHILADELPHIA, PENNSYLVANIA**

**FACTORIES: MANHEIM, PENNSYLVANIA • ELKHART, INDIANA • MONTREAL, CANADA**

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| Boston, Massachusetts | 303-04 North Station Building<br>150 Causeway Street |
| Buffalo, New York | Andrews Building |
| Cleveland, Ohio | 523-25-27 Rockefeller Building |
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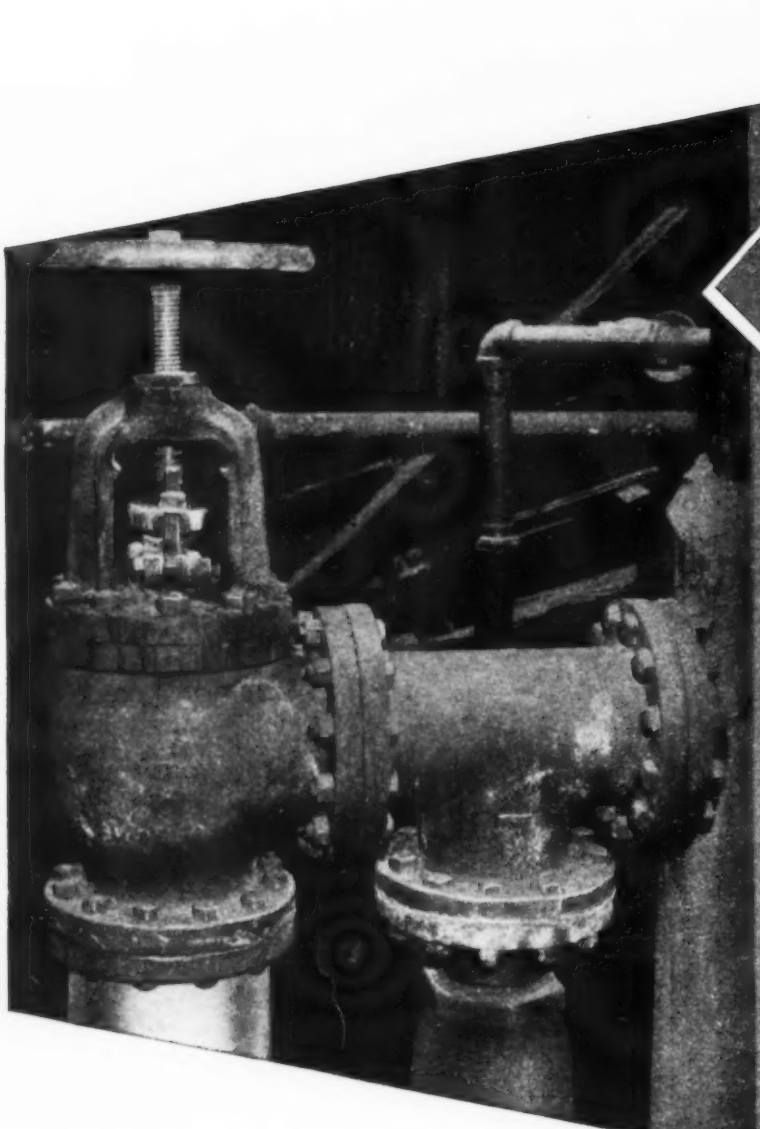
| Kansas City, Missouri | 1332 Oak Street |
| Los Angeles, California | 720 Mateo Street |
| Montreal, Canada | 5575 Cote Saint Paul Road |
| Milwaukee, Wisconsin | 4417 West North Avenue |
| New Orleans, Louisiana | 418 Common Street |
| New York, New York | 100 Sixth Avenue, near Canal |
| Philadelphia, Pennsylvania | 401 North Broad Street |
| Pittsburgh, Pennsylvania | 405 Penn Avenue |
| Portland, Oregon | Terminal Sales Building |
| San Francisco, California | 156 South Park |
| Seattle, Washington | 2207 First Avenue, South |
| St. Louis, Missouri | 1407 Pine Street |
| Tulsa, Oklahoma | 823 South Gary Place |
| Wilmington, California | 207 Avalon Boulevard |

# This is the 2ND in a series of messages



## 2a THE PROBLEM

Insulation of an 8" T and valve.

## 2b THE SOLUTION

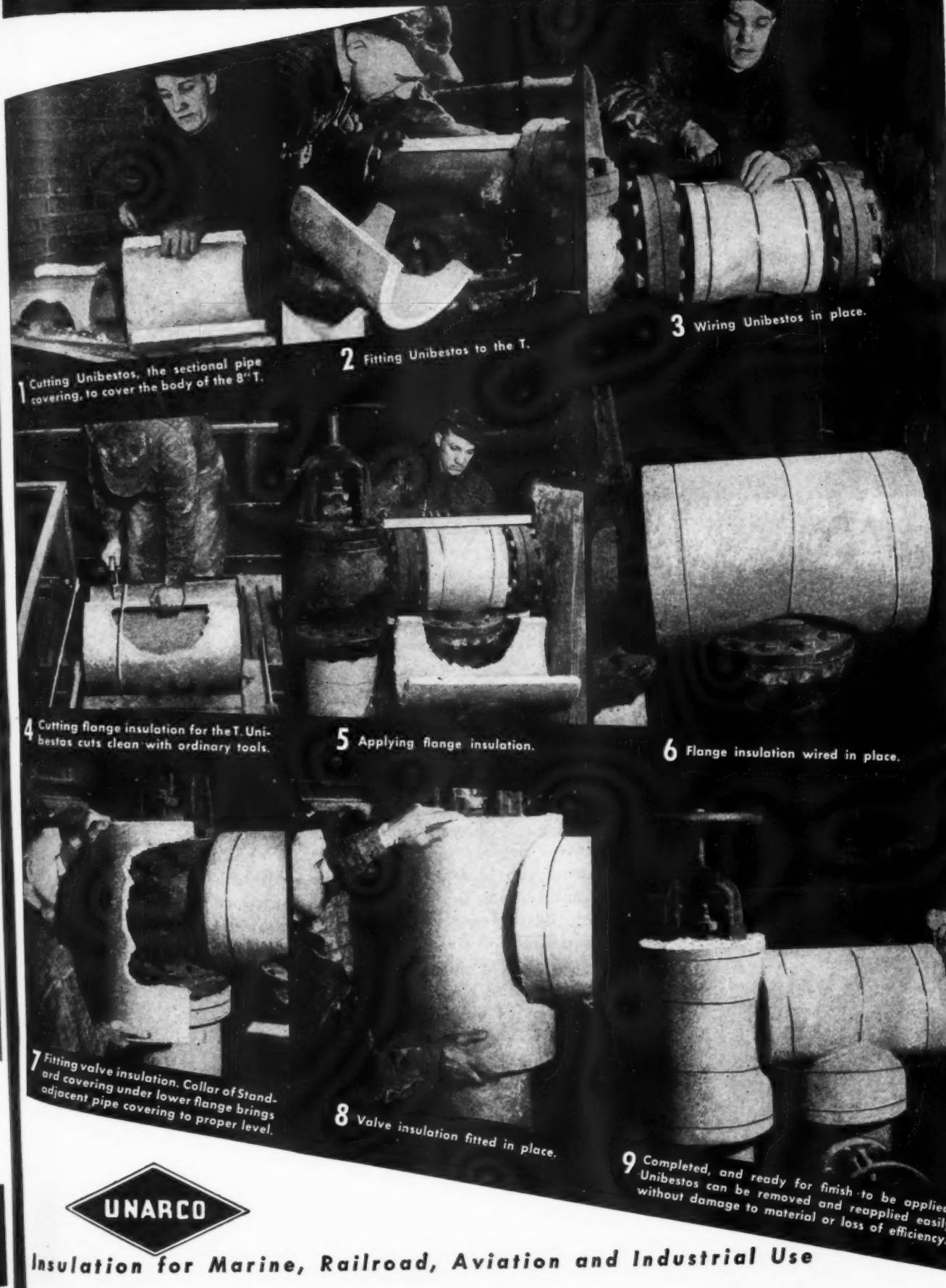
Application of Unibestos, the sectional pipe covering. Unibestos is available in Standard material for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 32" to 60" in quadrants from ¾" to 5" in thickness. Standard and Super Unibestos are available in single layer construction with provision for expansion in piping, where required.

TWO ARMY-NAVY "E" AWARDS FOR EXCELLENCE IN WAR PRODUCTION
ONE TO THE CICERO, ILLINOIS PLANT; ONE TO THE PATERSON, N. J. PLANT

**UNION ASBESTOS & RUBBER CO.**

GENERAL OFFICES: 1821 SOUTH 54TH AVENUE, CICERO, ILLINOIS • NEW YORK • SAN FRANCISCO • PATERSON, N. J.

# DEALING WITH THE PROBLEMS IN HEAT INSULATION FACED BY ENGINEERS AND SOLVED BY USING UNIBESTOS



1 Cutting Unibestos, the sectional pipe covering, to cover the body of the 8" T.

2 Fitting Unibestos to the T.

3 Wiring Unibestos in place.

4 Cutting flange insulation for the T. Unibestos cuts clean with ordinary tools.

5 Applying flange insulation.

6 Flange insulation wired in place.

7 Fitting valve insulation. Collar of Standard covering under lower flange brings adjacent pipe covering to proper level.

8 Valve insulation fitted in place.

9 Completed, and ready for finish to be applied. Unibestos can be removed and reapplied easily without damage to material or loss of efficiency.

UNARCO

*Insulation for Marine, Railroad, Aviation and Industrial Use*

# YOU CAN BANK ON FAIRBANKS

## for REGRINDING Iron Globe, Angle and Cross Valves

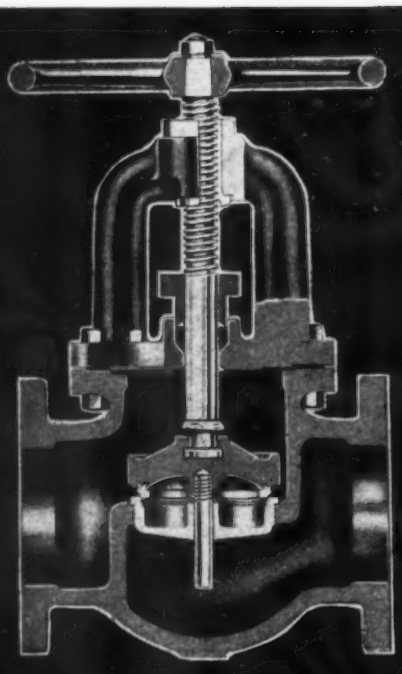


Fig. 0131

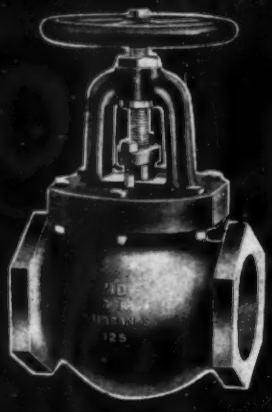


Fig. 0130

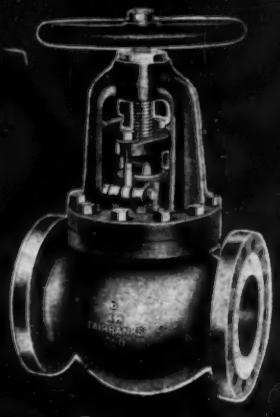


Fig. 0110

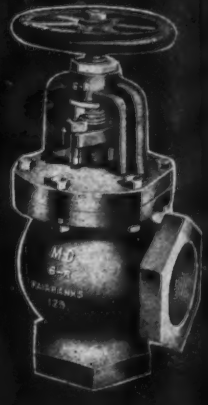
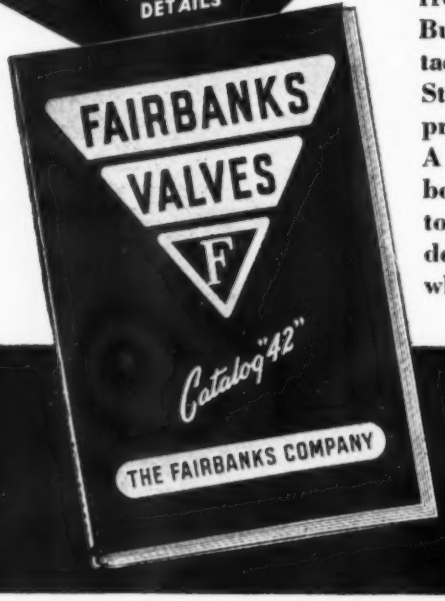


Fig. 0132

**OTHER FAIRBANKS VALVES**

Bronze Globe, Gate, Angle Cross and Check Valves
Iron Globe, Gate, Angle, Cross and Check Valves
Faircoseal Bronze Valves
U-Bolt Gate Valves
Asbestos Packed Cocks
Bronze Radiator Valves
Sphero Ball Valves

CONSULT FAIRBANKS NEW CATALOG No. 42 FOR DETAILS




**SERVICE:** Recommended for service on steam, water, oil and gas lines. Available for steam working pressures from 125 to 250 lbs.

**TYPES:** These Valves have Regrinding Bronze Bevel Discs and Seats and are recommended where close regulation of flow is required.

**FEATURES:** Disc and Seat may be reground without removing valve from pipe line. Seat Ring can be easily removed and replaced. Bodies and Bonnets are semi-steel, with an average tensile strength of 38,000 lbs. per sq. in. The globular-shaped bodies have maximum allowance for free-flow passages. Renewable Bronze Yoke Bushing provides a non-corrosive stem contact and reduces wear on threads. The Bronze Stems have Acme cut threads of generous proportions for strength and easy operation. A spider in seat ring and a guide stem on the bottom of discs, guide the bevel-faced discs to proper seating contact. Stuffing box is deep and can be repacked under pressure when wide open.

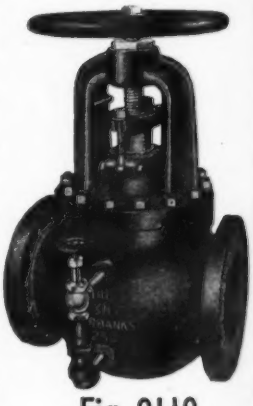


Fig. 0110 with By-Pass

## THE FAIRBANKS COMPANY

393 LAFAYETTE ST., NEW YORK, N. Y.
BOSTON, MASS. PITTSBURGH, PA.

*Distributors in Principal Cities*

# A LESSON IN WATER COOLING

LESSON 3 OF A SERIES

## AIR MOVEMENT, TOWER PERFORMANCE and PLANT OUTPUT

The maximum production of which a plant is capable requires dependable performance of all equipment at all times. Any weak link, such as an undependable cooling tower that retards the functioning of other equipment, is intolerable today when utmost output of war goods is imperative. Failure of a wind-dependent cooling tower to deliver required water temperatures during periods of low or adverse air movement can partially if not wholly *paralyze* production of high-octane gasoline, synthetic rubber, food, chemicals and machines vital to Victory.

An atmospheric deck type cooling tower that is designed for a higher wind velocity than it will receive *at all times* cannot be considered a dependable auxiliary. This type of tower, if designed on the basis of a given wind velocity, cannot maintain desired cold water temperatures with (a) less wind, (b) during calms or (c) when the wind, regardless of velocity, is blowing lengthwise or obliquely to the tower.

Therefore, since winds are unreliable both as to direction and velocity, atmospheric deck towers must be sized to deliver design performance with *no* wind effect (0 MPH) if they are to maintain uninterrupted efficiency comparable to an induced draft tower. Otherwise, whenever a plant or process depends upon exact and controllable water temperatures, continuous full-capacity operation cannot be assured.

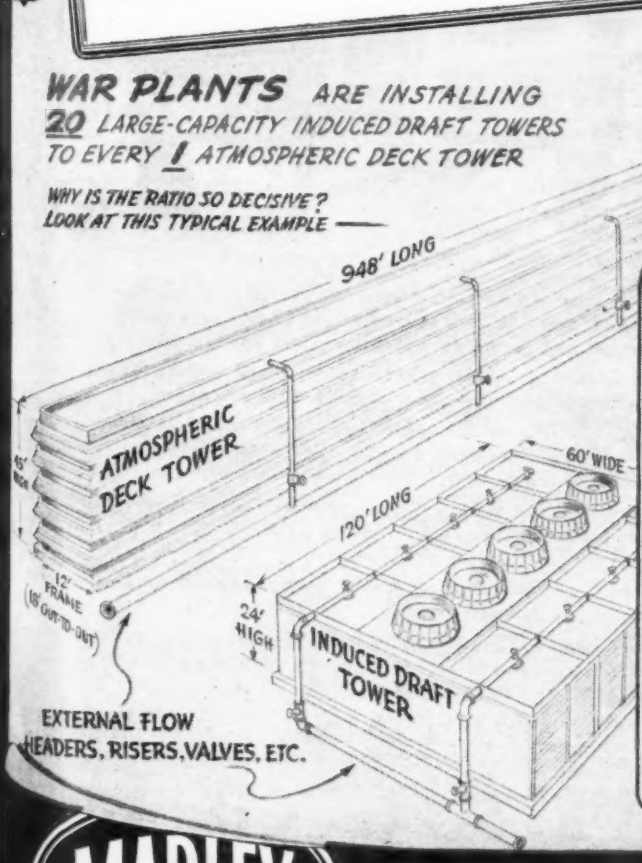
The mechanical induced draft cooling tower creates air movement by means of power-driven fans so that performance and water temperatures are under positive control at all times. Since the cooling medium (air) is furnished in a constant and dependable manner, this type of cooling tower is an always reliable auxiliary.

In addition to its prime advantage of dependability in maintaining full plant production, other factors favoring the induced draft tower include: Less ground space, negligible drift loss, less make-up water, lower pumping head, better appearance, lower first cost, lower operating and maintenance cost, and of especial importance now during wartime, shorter completion time, much smaller use of critical materials, fewer man-hours and less freight.

All these factors together have reduced atmospheric deck towers to a status of virtual obsolescence and practical applications for them are but a small fraction of the total.

***WAR PLANTS** ARE INSTALLING*
***20** LARGE-CAPACITY INDUCED DRAFT TOWERS*
*TO EVERY **1** ATMOSPHERIC DECK TOWER*

*WHY IS THE RATIO SO DECISIVE?*
*LOOK AT THIS TYPICAL EXAMPLE —*




## COMPARING TYPICAL TOWERS FOR IDENTICAL PERFORMANCE

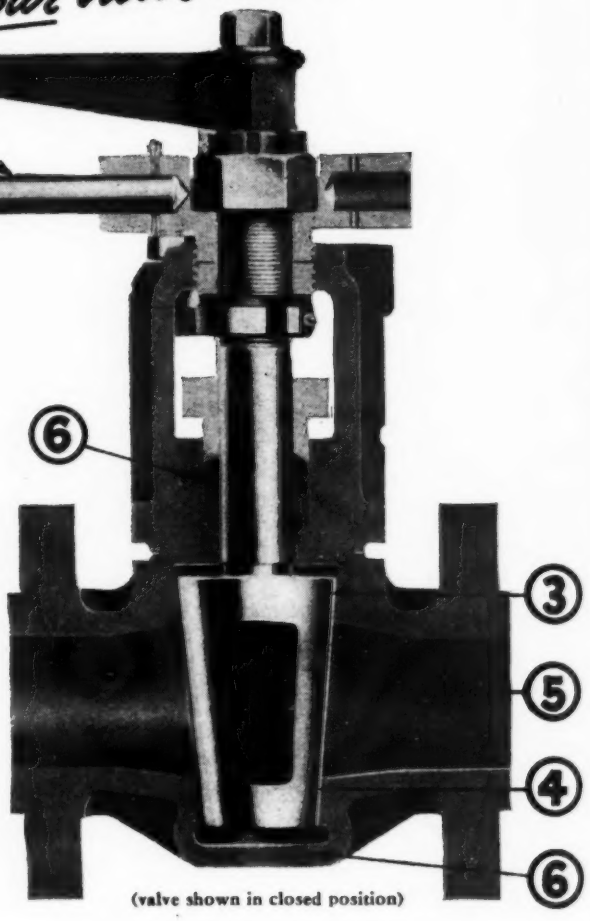
| | *WIND-DEPENDENT* ATMOSPHERIC DECK TOWER | *POSITIVE-POWERED* INDUCED DRAFT TOWER |
|---|---|---|
| CAPACITY - GALLONS PER MINUTE | 17,500 | 17,500 |
| TEMPERATURES - HOT, COLD & WET BULB | 100-80-70 | 100-80-70 |
| PUMPING HEAD - TOWER ONLY | 45 FT. | 26 FT. |
| LUMBER - BOARD FEET | 385,000 | 165,000 |
| *WEIGHT OF ALL LUMBER AT 3.2 LBS/BD. FT.* | *1,232,000 LBS.* | *528,000 LBS.* |
| STRUCTURAL STEEL | — | 4,900 LBS. |
| BOLTS & NAILS - GALVANIZED STEEL | 14,100 LBS. | 9,300 LBS. |
| REINFORCING STEEL FOR BASIN | 33,200 LBS. | 14,300 LBS. |
| CAST STEEL PARTS | — | 3,200 LBS. |
| CAST IRON - INTERNAL PIPING, PLATES, ETC. | 19,000 LBS. | 7,100 LBS. |
| CAST IRON - EXTERNAL HEADERS, RISERS, ETC. | 180,000 LBS. | 19,600 LBS. |
| *WEIGHT OF ALL STEEL & CAST IRON* | *246,300 LBS.* | *58,400 LBS.* |
| ELECTRIC MOTORS - TOTAL WEIGHT | — | 4,800 LBS. |
| MISC. MATERIALS - TOTAL WEIGHT | — | 800 LBS. |
| CONCRETE FOR BASIN - CUBIC YARDS | 550 | 250 |
| *WEIGHT OF ALL MATERIALS EXCEPT CONCRETE* | *1,478,300 LBS.* | *592,000 LBS.* |
| *FREIGHT, ALL MATERIALS EXCEPT CONCRETE* | *31 CARLOADS* | *12 CARLOADS* |

MARLEY COOLING TOWERS

THE MARLEY COMPANY INC.
KANSAS CITY, KANSAS

# What it takes . . . they've GOT!

## *Prove it by Checking these* HOMESTEAD LEVER-SEALD *features against your valve needs!*




(valve shown in closed position)

Maritime's two-flag, highest production award to our men and women making valves for the Victory Fleet.

1. **Instant stick-proof operation.**
2. **Quarter-turn fully opens or closes.**
3. **Positive seal without lubrication.**
4. **Seating surfaces always protected.**
5. **Unobstructed straight-line fluid flow.**
6. **Outside leakage prevented.**

Built into this valve is a powerful lever and screw which relieves seating pressure between plug and body just enough to overcome friction and permit easy turning under any condition.

After seating pressure has been relieved by the lower handle, a quarter turn of the upper handle fully opens or closes the valve.

After opening or closing, full seating pressure is always re-applied by the lower lever to make a positive, leakless seal without need of any lubricant.

Since the plug is never really unseated (only relieved of pressure) the seating surfaces are protected from injurious matter in all positions for longer, leak-proof service.

Minimum pressure drop results from straight-through flow and unobstructed passage of fluid.

Leakage of fluid to the outside of the valve is prevented by a sealed bottom and extra deep stuffing box around stem. Saves fluid loss and reduces hazards.

MAKERS OF "PEAK PERFORMANCE" VALVES FOR 50 Years 1892 1942

## HOMESTEAD VALVE MFG. CO.

P. O. BOX 210 • • • CORAOPOLIS • • • PENNSYLVANIA

# ROEBLING "Blue Center" helps 'em get there first!

Pushing stubby assault boats ashore, through withering enemy fire, storming the beaches and mopping up enemy strong points—advancing inland to take and hold strategic airports, towns, road and railroad junctions—there is more to a successful invasion than these stirring deeds of U. S. fighting men in North Africa. To make that invasion possible, to make it *stick* till all objectives are fully attained, takes the brains and brawn of thousands of men who may never get to see the fighting at all—sailors on escorting warships, seamen on transports, dockworkers and stevedores to load and unload thousands of tons of equipment and supplies. It is these men and their ships *and their rope-equipped machinery* that make up the physical basis of *logistics*—the art and science of getting there first with the most and *staying longest!*

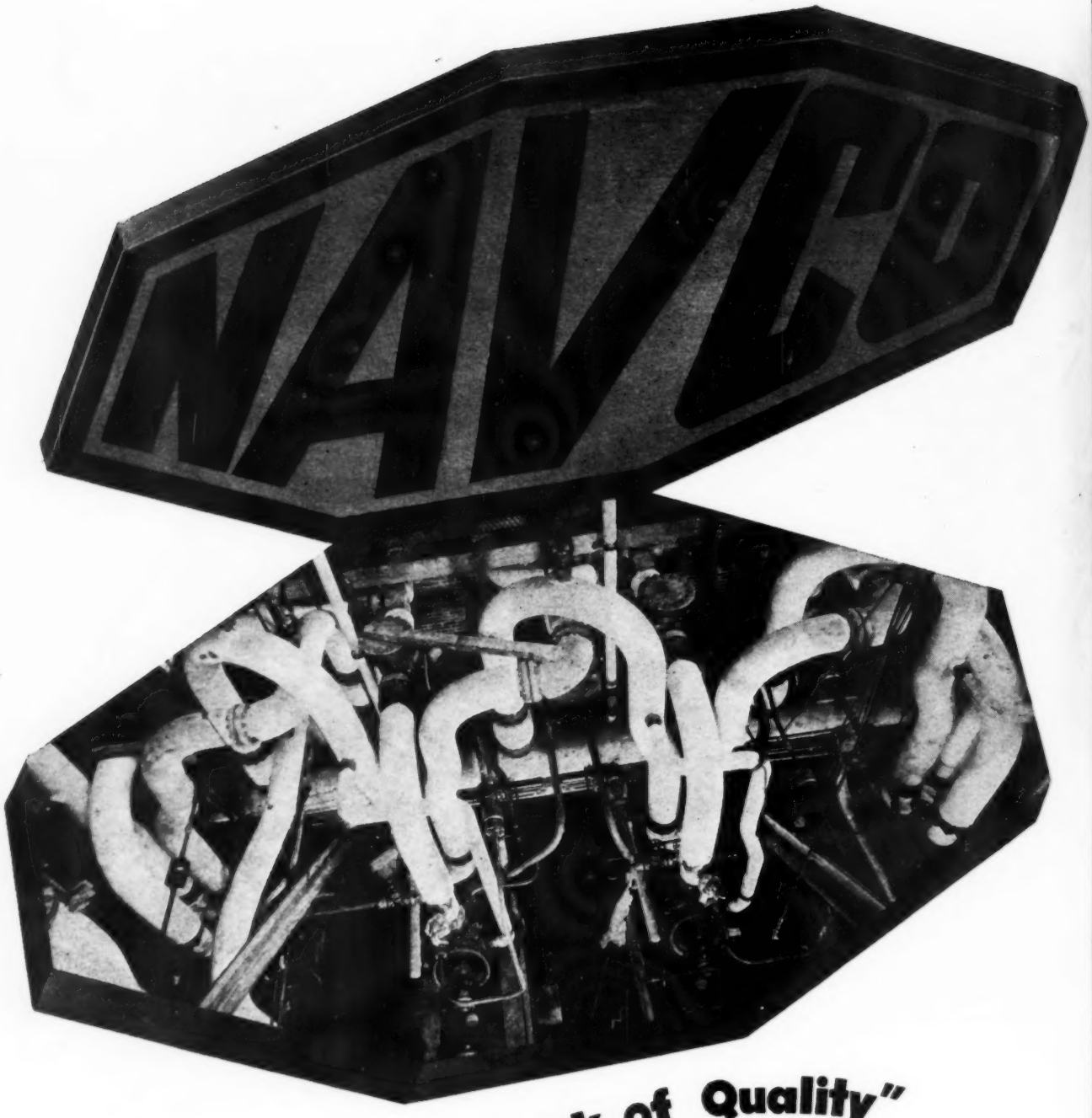
It's a tough job, meeting all the needs of a sizeable army in the field against a powerful enemy. Army Engineers and special stevedore units, Navy crewmen, merchant seamen—all of them swing to with a will. And they keep the ammunition coming for men and guns. In many of these places where the going is tough today, Roebling "Blue Center" Steel Wire Rope is in there swinging. Bringing to this tough job too the extra values built into it by Roebling Engineers out of their experience in the field—in Roebling's mills—in Roebling Development Engineering. Meeting unfailingly all the demands of Victory.

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR
NON-PREFORMED

## *YOUR* ROPE LOGISTICS . . . GET THE MOST OUT OF IT!

You can do a lot to save steel by observing simple precautions in the installation and handling of wire rope, and help conserve rope for use by our fighting men. To make the job even easier, Roebling has prepared a handy tag—yours for the asking—to fasten right to your machinery where it'll do the most good. Our nearest office will gladly supply you with as many as you need. Ask for Tag "A".

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
*Branches and Warehouses in Principal Cities*




"Under the Navco Mark of Quality"

For the past thirty-five years Navco has been a mark of quality in the Piping Field. This quality service is available to you whether you require a single pipe bend or a complete High Pressure-High Temperature Installation. Consult Navco for your next Piping job.

**NATIONAL VALVE & MANUFACTURING CO.**
PITTSBURGH, PA.

NAVCO

# NAVCO PIPING

*No. 1 in a series of tributes to America's War Industries*

# BUZZARDS GET BRUSHED OFF LIKE FLIES

Far above the reach of man's eyes or ears, a flock of deadly eagles hovers over Naziland, laying eggs with uncanny accuracy. They are American-flown, American built long range bombers . . . and even the best of the German fighter planes that rise up to give battle are no match for these tough warbirds. They brush the buzzards off like so many flies . . . send them flaming back to the hell they came from.

Every day new swarms of these unsurpassed four-motor bombers come off our aircraft production line . . . a production line as long and as wide as the United States itself, yet as accurate and as integrated as the workings of a fine watch. American skill, American sweat, American methods have made it so.

And what is true of our heavy bomber output is equally true of tanks, guns, ships, ammunition . . . our entire war production. American industry has its sleeves rolled up . . . is swinging from the heels . . . with all its tremendous might!

**IN PLANTS OF ALL TYPES**

**TODD BURNERS**

**ARE WORKING FOR VICTORY**

Wherever trouble-free, dependable combustion of liquid and gaseous fuels is a necessity . . . in war plants, in countless merchant and fighting ships . . . Todd Burners are delivering an unsurpassed performance in the production of heat and power.

**TODD SHIPYARDS CORPORATION**

**TODD COMBUSTION DIVISION**

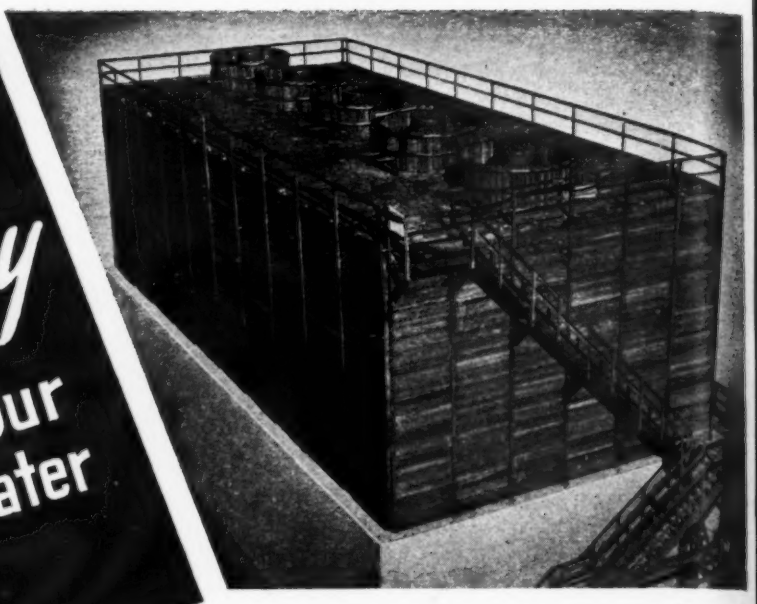
**601 West 26th Street, New York City**

NEW YORK MOBILE NEW ORLEANS GALVESTON
SEATTLE BUENOS AIRES LONDON

TODD BURNERS ★ ★ ON THE FIRING LINE OF AMERICA'S WAR PRODUCTION FRONT

# How to Save a Lot of Money

## By CAPITALIZING Your Mechanical Draft Water Cooling Costs



A mechanical draft cooling tower is, in most cases, a means of saving money. The cost of that tower, erected and ready for service, plus the cost per year to operate it, are therefore completely tied up together. To know just where you will stand in five years, both first cost and operating cost should be figured *when the tower is bought.* That is cost capitalization.

Pritchard mechanical draft towers almost invariably show a saving when competition is on this basis. The reasons why are discussed in the column at the right. This saving usually is substantial enough to make any reasonable first cost acceptable.

That is why it will pay you to get cost capitalization figures from Pritchard—and from all other bidders—before you buy any mechanical draft cooling tower. Write today.

### THESE IMPORTANT FACTORS Reduce Pritchard Mechanical Draft Operating Costs

**1. High Efficiency, Light Weight, Non-Corrosive Monel Fans.** Pritchard fans are the heart of Pritchard tower efficiency and economy. Their superior design and construction saves tremendous amounts of horse power over a period of years. Blades have a special twist and taper that gives a steady, uniform air flow through the entire fan opening.

The use of non-corrosive sheet monel over a light, strong framework cuts weight to half that of cast alloy – ends corrosion and pitting troubles. Larger blades, and often fewer of them, move the required volume of air with less fan speed and less fan power. Pritchard fan drive design and fan housing design, particularly in induced draft towers, contribute further to fan efficiency and horsepower economy.

**2. Low Pumping Head.** Closed pipe water distribution through gravity sprinklers cuts down frictional resistance; saves pump power for lifting; sometimes even permits building higher towers without waste.

**3. Liberal Size and Rating.** Any "skimping" on capacity must be made up by an extra load on fans or tower efficiency will suffer. Pritchard towers are sized and rated to permit low air velocities and consequent lighter fan loads.

Further details on request. Write for them.

**J. F. PRITCHARD & COMPANY**

FIDELITY BUILDING KANSAS CITY, MO.

• Branch Offices in Tulsa, Okla.; Houston, Texas; Atlanta, Ga.; Chicago, Ill.. Pittsburgh, Pa.; New York City

# PRITCHARD

***Atmospheric and Mechanical Draft***

## WATER COOLING TOWERS

# WORTH LOOKING FOR

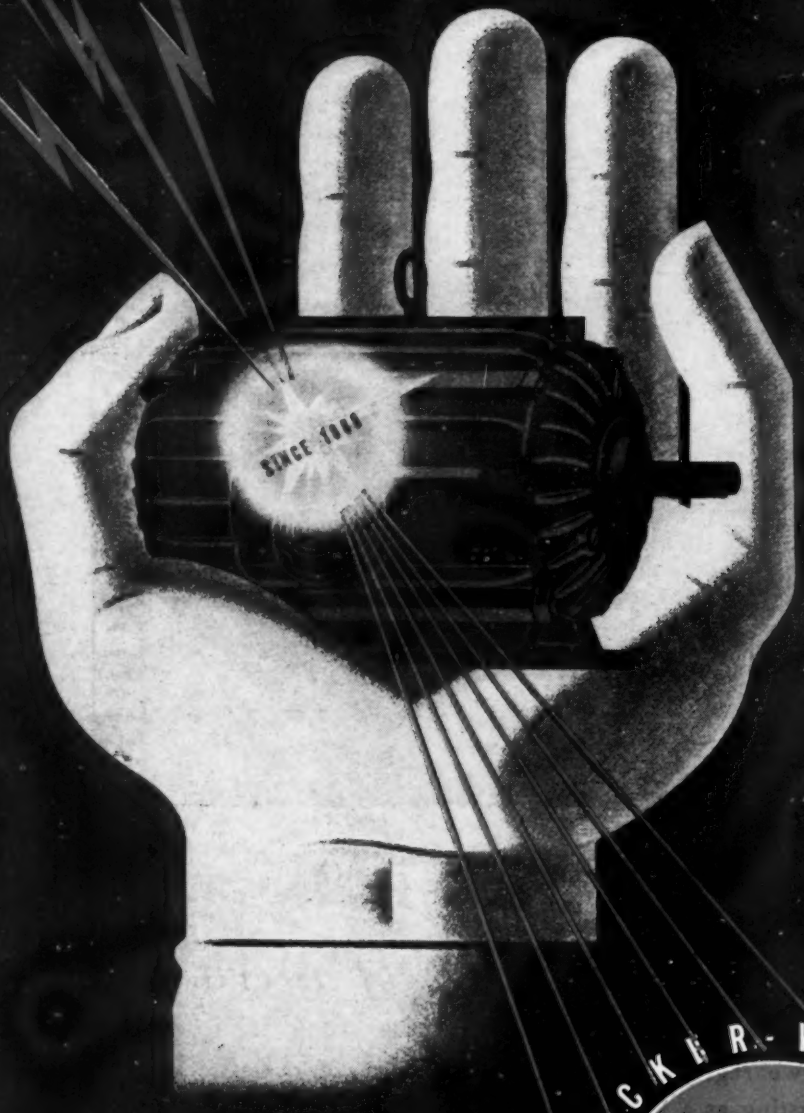
## . . . *because it's a Badge of Merit*

Here at Sivyer we regard the mark Ⓢ on a casting as a sort of merit badge—a sign that the casting is entitled to the highest rating for quality we know of. It's a rating not lightly bestowed, for no casting bearing this mark leaves the foundry until and unless it meets every Sivyer standard—for accuracy of chemical composition, for uniformity of internal structure, for dimensional accuracy, for superiority of finish.

If you want a source for merit-rated steel castings, we can easily show you how Sivyer qualifies.

**SIVYER STEEL CASTING COMPANY**
MILWAUKEE Ⓢ CHICAGO Ⓢ

# NEED MOTORS OR GENERATORS?




IF you need motors or generators, write or wire us . . . or consult your nearest Crocker-Wheeler office. We can make immediate deliveries on some types . . . but regardless of type, we can deliver in faster time than ever before.

New and vastly increased productive facilities, plus expert Joshua Hendy planning are the reasons. Crocker-Wheeler Electric Mfg. Co., Ampere, N. J. Division of JOSHUA HENDY IRON WORKS

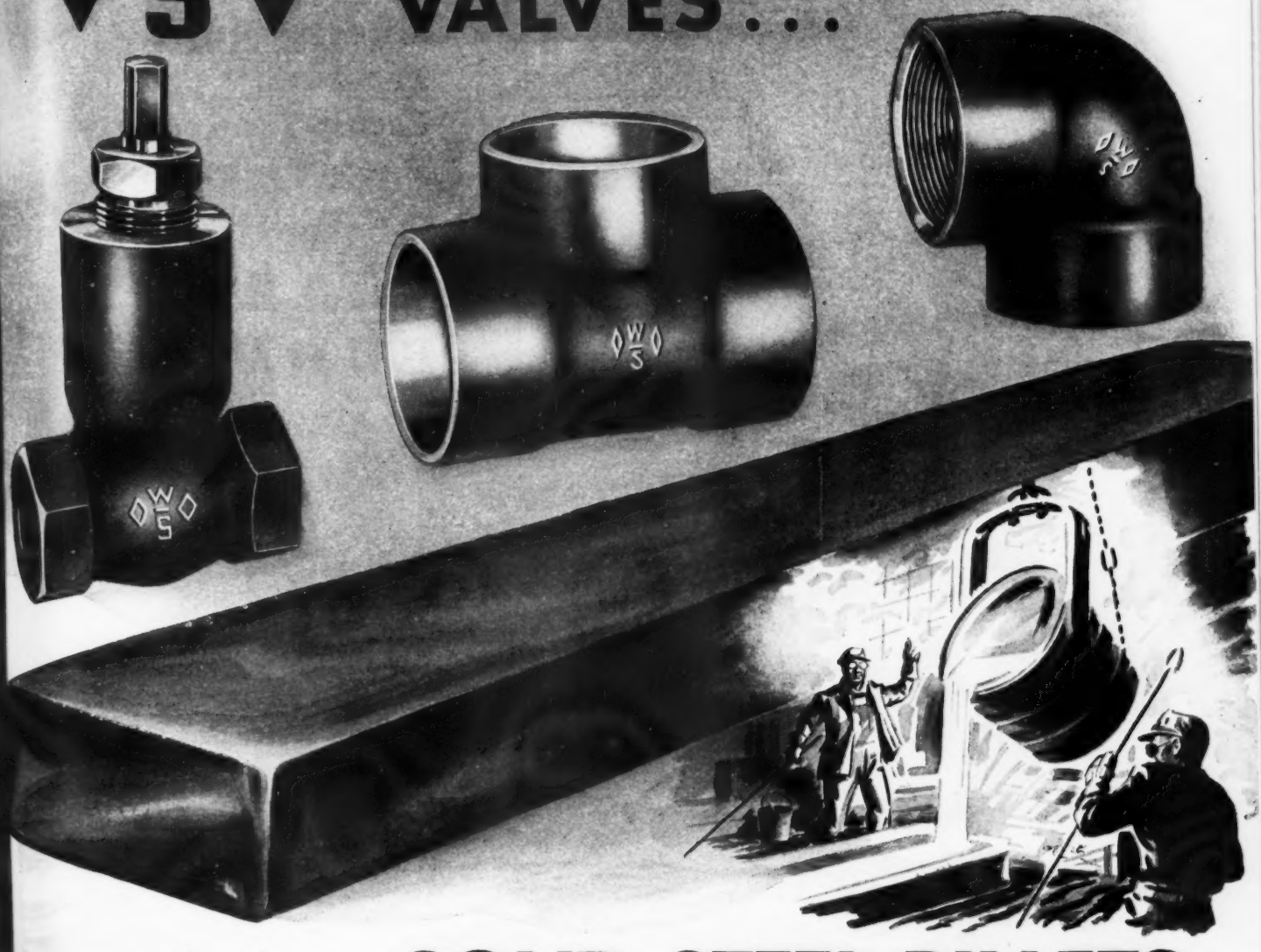
CROCKER-WHEELER

TRADE MARK REG. U. S. PAT. OFF.

Be SURE . . . with
CROCKER-WHEELER

Other JOSHUA HENDY IRON WORKS factories at Sunnyvale, Pomona and Torrance, California and St. Louis, Mo.

# W-S FITTINGS AND VALVES...



## *made from* SOLID STEEL BILLETS

The complete line of Watson-Stillman forged steel fittings includes screwed and socket welding fittings, elbows, tees, crosses, laterals, couplings, reducers, bushings, caps, plugs and unions. These products are all made from solid steel billets of the same rigidly controlled quality. Modern manufacturing methods insure uniform wall thickness, maximum wall strength and absolute concentricity. Full details of the complete line are given in Bulletin A-3.

Watson-Stillman now manufactures high-pressure valves for hydraulic service in types never before furnished. Many former W-S valves have been redesigned on new engineering principles and include improvements in size and structure. Bulletin A-4 describes the complete line. The Watson-Stillman Co., Roselle, N. J.

## WATSON-STILLMAN

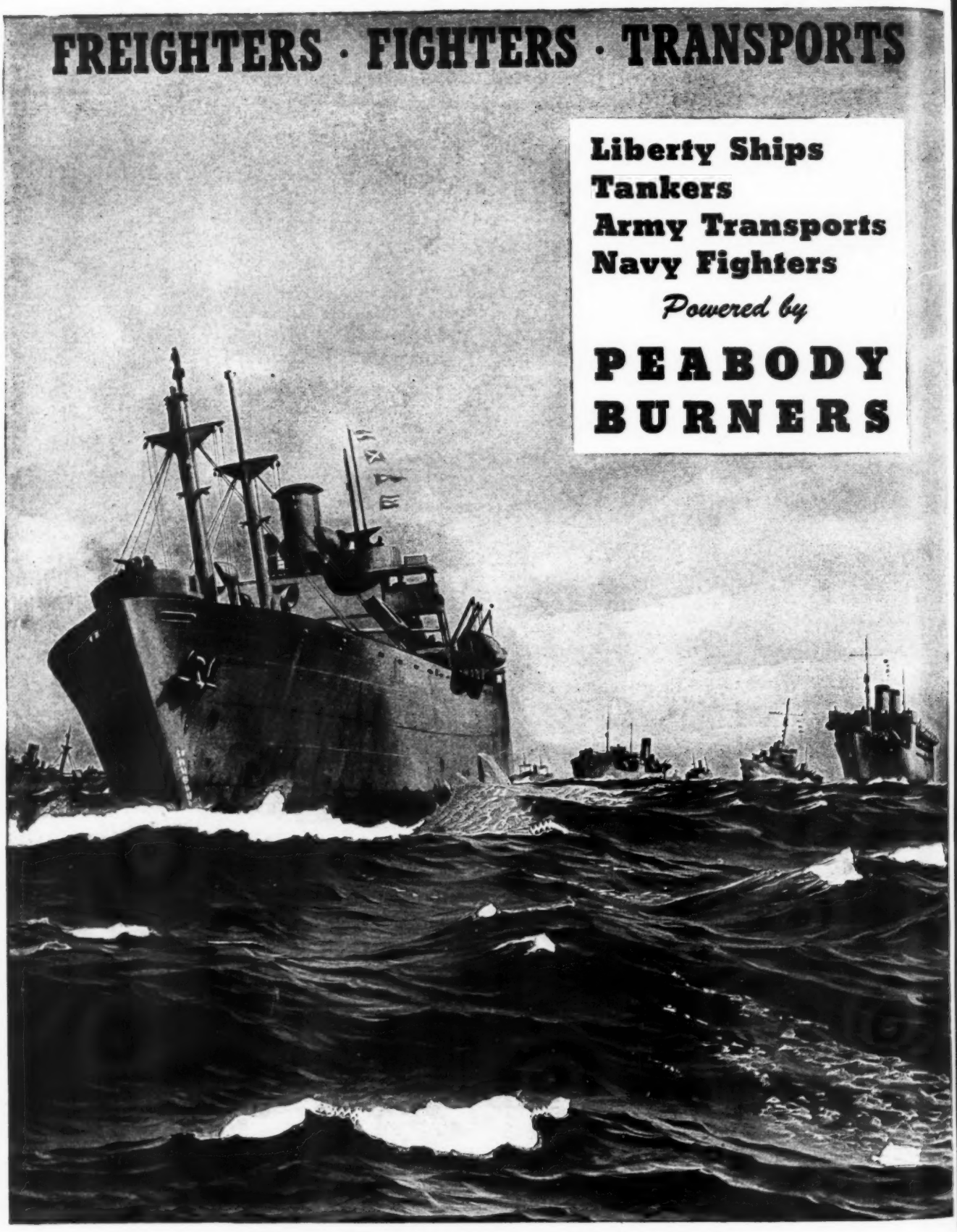
***Distributor Products Division***

**Engineers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears, Pumps, Jacks and Hydraulic Machinery and Equipment.**

★★★ *For Victory* ★ *Let's all be Scrappers* ★

3971

# FREIGHTERS · FIGHTERS · TRANSPORTS




**PEABODY ENGINEERING CORPORATION**

**580 Fifth Avenue, New York**

MONTREAL · BOSTON · NEW YORK · PHILADELPHIA · NEW ORLEANS · HOUSTON
LOS ANGELES · SAN FRANCISCO · PORTLAND, ORE. · SEATTLE · VANCOUVER
HONOLULU · PEABODY LTD., LONDON · BUENOS AIRES

*A reproduction of this painting, containing no advertising, will be sent free upon request.*

# THE GENERAL MANAGER ASKED:

# *"Why change to Ozalid Whiteprints?"*

YOU CAN COUNT ON the General Manager firing a line of questions when radical changes are suggested.

Here are three questions frequently asked by hard-thinking, hard-boiled executives when the engineering department requisitions an Ozalid Whiteprint Machine. And here are some sound reasons why so many have been convinced of Ozalid's superiority over old-fashioned printmaking methods.

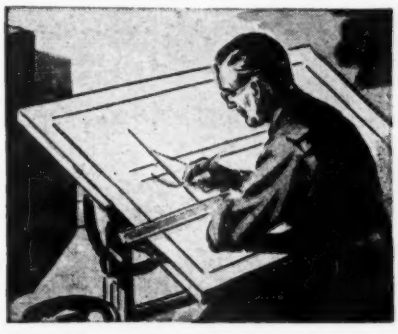
**Q.** ***What's wrong with our present equipment?***

**A.** Compare with Ozalid's. An Ozalid machine turns out whiteprints of engineering drawings, charts, letters in two fast steps—EXPOSURE and DRY DEVELOPMENT. There are no liquid baths, no plumbing connections, no solutions to mix. A score of other maintenance headaches have also been eliminated.

And, an Ozalid Whiteprint Machine is so clean and compact . . . it may be installed right in the drafting room. Anyone can operate it at top efficiency.

**Q.** ***Why is the Ozalid Process the most versatile?***

**A.** You can do so much more! (a) You can make prints having black, blue, or maroon lines on a white background. The maroon line is recommended for the shop since it shows the greatest contrast to grease and dirt . . . and will stand up better than the white line of a blueprint. (b) You make duplicate originals the same way you produce standard prints —without Van Dyke tieups. (c) You can use cut sheets as well as roll stock in an Ozalid machine. Thus, you can completely eliminate trimming waste by using sheets the size of your tracings.



**Q.** ***How can Ozalid save a thousand hours in our drafting room?***

**A.** Give a draftsman an Ozalid duplicate of a tracing which you want changed in part. He'll have a "new" original in a fraction of the time required with other methods. First, he eradicates the obsolete lines with Ozalid Corrector Fluid. Then he draws in the new design. It's that easy! It's *never* necessary to redraw any line which remains the same as in the original.

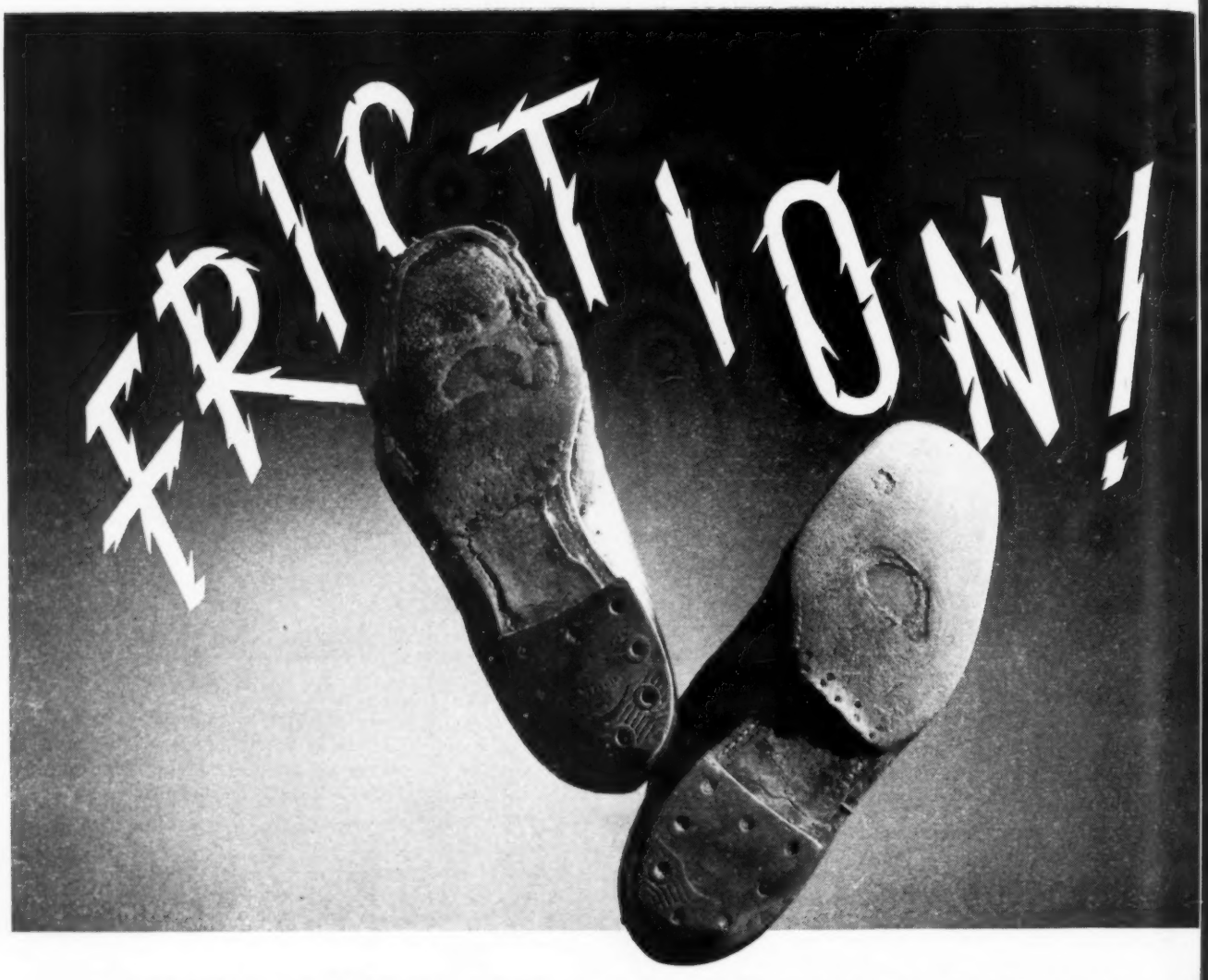
Think of the changes you're making in your products today. Think of the changes you'll be making in the post-war period. By installing an Ozalid Whiteprint Machine—you'll be sure of a "head start."

## OZALID PRODUCTS DIVISION

**GENERAL ANILINE AND FILM CORP.**

**Johnson City, N. Y.**

**Write for "Simplified Printmaking." It shows how leading manufacturers save time, labor, and materials with the Ozalid Process.**




# REDUCE WEAR AND REMOVE CARBON WITH MACMILLAN RING-FREE MOTOR OIL

Undue motor wear, waste of fuel and excessive carbon have no place in a sound preventive maintenance program. At the same time, "production" must be speeded up. That's why operators simply must pay more than usual attention to motor lubrication . . . and motor *cleanliness.*

Macmillan RING-FREE Motor Oil cuts down waste and wear while speeding up performance, and at the same time, RING-FREE removes carbon!

In 1094 Certified Road Tests, with various makes of owner-driven cars, 10 per cent increases in gasoline mileage were not uncommon after crankcases were drained and refilled with RING-FREE. As indicated by these tests, the average immediate saving was 1.3 miles per gallon! These tests emphasize that RING-FREE lubricates better . . . *reduces friction faster.* It delivers direct to the drive shaft more of the horsepower ordinarily wasted in overcoming motor friction. It postpones "down-time" for repairs.

Macmillan RING-FREE Motor Oil combines all these qualities: great film strength, high heat resistance, long cling to metal, fast penetration . . . *plus* the fact that it is non-corrosive, is less affected by dilution and it *removes carbon.*

## CARBON REMOVAL A NATURAL RING-FREE FUNCTION

Macmillan RING-FREE Motor Oil actually removes carbon while the motor runs! Hence, by its continued use, pistons, rings, valves—all vital parts—stay cleaner. Carbon removal is a natural function of RING-FREE, inherent in the crude oil and retained by the exclusive Macmillan patented refining process, *without the use of additives.*

*TO SUM UP: MACMILLAN RING-FREE gives more horsepower to the drive shaft—tangible saving of fuel—allows less wear on hard-to-replace engine parts—it removes carbon.*

**Macmillan Petroleum Corporation**

50 W. 50th St., New York • 624 S. Michigan Ave., Chicago • 530 W. Sixth St., Los Angeles

Copyright 1943
Macmillan Petroleum Corp.

**MACMILLAN RING-FREE MOTOR OIL**

**REDUCES WEAR BY REDUCING FRICTION**

*for continued high* ACHIEVEMENT

The Ohio Injector Company — first in the valve industry to receive the coveted Army-Navy "E" award for high achievement in the production of war equipment now has been awarded the first Star for "continued high achievement."

To our Distributors, their OIC Customers and our suppliers we again say:

*"You rightfully share with us in this honor. Thank you sincerely for your splendid cooperation."*

OIC

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

*Quality Leaders in Valve Manufacture Since 1883*

# Most boiler outages

**WATER SAMPLES** are accurately checked to see that oil content is being kept to a minimum.

**CONDUCTIVITY METER** tests to determine the solids in the condensed steam, reveal (1) carry over from the boiler (2) contamination of condensate.

# are a needless war waste

**PREVENTIVE CARE** in action. Samples of boiler water from the nation's vital war plants. Careful periodic analyses by Hall Laboratories, in conjunction with the simplified control analyses made regularly by the plant personnel, assure the proper water treatment to keep these plants in steady operation year after year.

## Critical production gives new emphasis to the need for *preventive care*

A BOILER should produce steam efficiently, month in and month out. Unscheduled outages should be rare. Where they are frequent, you can be sure something is wrong. As in the case of human beings, sometimes a boiler requires an operation before it can attain good health; more often, however, all it needs is to be put on the proper diet.

That's where preventive care comes in—doing the things that need to be done . . . and in time . . . so that troubles won't have a chance to develop.

It takes a lot of doing. More than most operators care to undertake alone. Even those whose equipment is the finest and whose plants enjoy the benefit of the most modern laboratories, engage technical help. Hundreds of such plants are Hall clients. They know that preventive care is the safest, surest, most economical way to prevent boiler outages.

From the moment a boiler goes into service, certain factors, unless stopped, go to work to reduce its efficiency. The most serious of these are scale, corrosion, carryover and embrittlement. Thanks to the scientific preventive care pioneered by Hall, they can be controlled. Thereby loss from tube or condenser failure is held at a minimum. A dirty boiler is a sure sign that causative conditions should be diagnosed and remedied.

Your experience with Hall Service would probably be different from any you have ever known. You would have a field engineer on the job whose sole interest is to cooperate with you to keep your boilers in fighting trim—a salaried technician with nothing to sell but his knowledge. This is the unique difference in Hall Service. Ask us to explain it.

**HALL LABORATORIES, INC.**

*A subsidiary of Hagan Corporation*

**HAGAN BUILDING, PITTSBURGH, PA.**

## *Hall Service in a Nutshell*

*At your immediate disposal are placed the technical knowledge and facilities of the pioneering leaders in scientific boiler water conditioning. In addition, with your full cooperation, Hall Service:*

1. Minimizes boiler outages caused by water.
2. Helps maintain highest efficiency.
3. Establishes non-embrittling water.
4. Minimizes carryover.
5. Prevents corrosion in boilers and associated equipment.
6. Prevents deposition in water lines and cooling systems.

**HALL SYSTEM**
*of Boiler Water Conditioning*

**HAGAN**
**HALL**
**BUROMIN**
**CALGON**

| | |
|---|---|
| Louttit Laundry | Providence, R. I. |
| What Cheer Laundry | Providence, R. I. |
| Swiss Cleansing Co. | Providence, R. I. |
| Page Realty Co. | Providence, R. I. |
| Manhattan Laundry | Washington, D. C. |
| Bell Aircraft Modification Center | Niagara Falls, N. Y. |
| Shoreham Hotel | Washington, D. C. |
| Alco Fabricating Corporation | Pawtucket, R. I. |
| World Bestos Corperation—Subsidiary of Firestone Tire & Rubber Co. | Paterson, N. J. |
| Bangor Steam Heat Co. | Bangor, Pa. |
| Bergman's Laundry | Washington, D. C. |
| Otis Elevator Co. | Buffalo, N. Y. |
| Fort Myer | Va. |
| Irons & Russell Co. | Providence, R. I. |
| Rhode Island State College | Kingston, N. Y. |
| Stamford Hospital | Stamford, Conn. |
| Electro Metallurgical Corp. | Niagara Falls, N. Y. |
| Sterling Laundry Co. | Washington, D. C. |
| Eastern Laundry Co. | Newark, N. J. |
| Newark A B C Laundry | Newark, N. J. |
| Humboldt Dye Works | Brooklyn, N. Y. |
| Fairmount Dye Works | Woonsocket, R. I. |
| Gottfried Baking Co. | New York, N. Y. |
| Modern Majestic Laundry | Long Island, N. Y. |
| Dunn Woolen Co. | Martinsburg, W. Va. |
| Koch Brewing Co. | Dunkirk, N. Y. |
| Norton & Co. | Washington, D. C. |
| Elkins Laundry | Elkins, W. Va. |
| Page Laundry | Washington, D. C. |
| Victor Silk Hosiery Mills | New Britain, Pa. |
| Dickey Cleaners | Washington, D. C. |
| Morin Heights Housing Project | Woonsocket, R. I. |
| Harbor Terrace Housing Project | Fall River, Mass. |
| Mitchell School | Kittery, Maine |
| Abrasive Machine Tool Co. | East Providence, R. I. |
| Max Pollack & Co. | Willimantic, Conn. |
| U. S. Department of Agriculture | Beltsville, Md. |
| Groton Housing Project | Groton, Conn. |
| Scarsdale Chateau | Scarsdale, N. Y. |
| Collyer Insulated Wire Co. | Pawtucket, R. I. |
| Automatic Machine Products Co. | Attleboro, Mass. |
| Warwick Co. | E. Warwick, R. I. |
| Carlton Theatre | Providence, R. I. |
| Majestic Theatre | Providence, R. I. |
| Liggett Drug Co., Inc. | Providence, R. I. |
| John McKenzie Packing Co. | Burlington, Vermont |
| Kennett High School | Conway, New Hampshire |
| Kennebunk High School | Kennebunk, Maine |
| Family Laundry | Jamestown, N. Y. |
| Grafton Co. Home | N. Haverhill, New Hampshire |
| Smith Greenhouse | Tewksbury, Mass. |
| District Linen Service | Washington, D. C. |
| 34 East Putnam Ave. Corp. | Greenwich, Conn. |

# Famous Names IN INDUSTRY BUSINESS AND GOVERNMENT

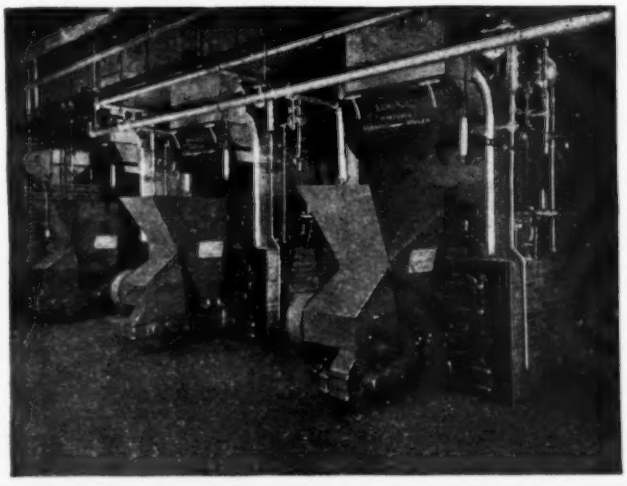
## A REPRESENTATIVE LIST OF SATISFIED USERS OF

# CANTON STOKERS

• This partial listing of satisfied CANTON STOKER users shows clearly CANTON'S adaptability to all types of fuel . . . CANTON'S useability under all operating conditions. From the largest Industrial plant to the smallest COMMERCIAL installation CANTON STOKERS have established an enviable record of service . . . a record that can be directly traced to CANTON'S 31 years experience in the manufacture of fuel burning equipment, plus an Engineering Service, which adapts each installation to suit local conditions.

In addition, because only the finest workmanship and materials are used, CANTON STOKERS are guaranteed for FIVE YEARS . . . not only against defects but WEAR as well.

Get the full story . . . consult CANTON at once. Trained Engineers will gladly survey your plant and offer recommendations—no obligation to you. Write, wire or phone now for Descriptive Literature.



CANTON STOKER CORPORATION

ANDREW PLACE, S. W., CANTON, OHIO

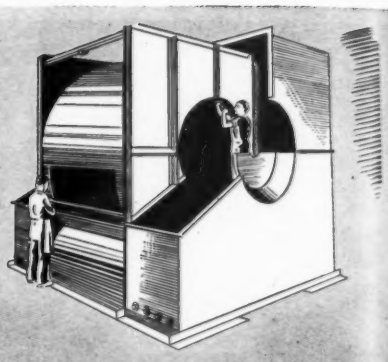
IN 194..? M-H/Brown Electronic Recording and Control Instruments will usher in a new era in peacetime production.

In the manufacture of chemicals, steels, textiles, rubber, ceramics, paper, foods—and other products, M-H/Brown Electronic Instruments will provide a new conception of greater precision in measuring and controlling industrial processes.

We are proud of the M-H/Brown background of over 100 years experience in instrument engineering which *pioneered electronic instrumentation*—that has gone to war—in planes, tanks, ships, etc. When peace comes these instruments will be available to industry. *M-H/Brown Electrons are coming.* THE BROWN INSTRUMENT COMPANY, 4490 Wayne Avenue, Philadelphia, Pennsylvania, a division of MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, Minneapolis, Minnesota. Offices in all principal cities. 119 Peter Street, Toronto, Canada — Wadsworth Road, Perivale, Middlesex, England—Nybrokajen 7, Stockholm, Sweden.

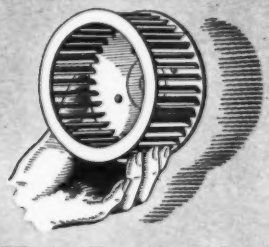
*Instruments by* **BROWN** *and Controls by*

**MINNEAPOLIS-HONEYWELL**



### *Specially Built . . . as Big as They Come . . .*

**Each fan (see text, bottom of ad) weighs 41,000 lbs. — measures 13 ft. high, 20 ft. long, 14 ft. wide—from standpoint of size, something of a record! Fan wheels turn in water-cooled bearings. This effective cooling prevents lubrication from breaking down under 505° F. operation.**



### *or Mass Production of Small Fan Units*

**For use in connection with vital war work, Clarage also can furnish small fans or fan wheels only in any desired quantities. Many such units are keeping motors cool in American tanks as they shoot it out in Tunisia, Russia.**

# CLARAGE

INVEST IN VICTORY: Buy More War Bonds!

## TAILORED BY CLARAGE FOR 505° F. *plus* CONTINUOUS ABRASIVE ACTION

Photo above shows wheel construction used in four large Clarage fans recently ordered by Combustion Engineering for Inland Steel.

These fans will operate in conjunction with a sintering furnace which dries and purifies iron ore prior to the making of steel.

***Each fan will exhaust per minute 242,000 cu. ft. of hot gases and abrasive dusts at 505° F.—driven by 1000 h.p. motor.*** Clarage fans for tough jobs such as this are specially tailored throughout for unfailing performance despite high temperatures, and the continous handling of highly abrasive materials. Heavy-duty construction!

***If your war-time production requires air-handling equipment of any type or size, call on us! All the way from initial planning to delivery, we are prepared to give the kind of service your urgent needs demand.***

**COMPLETE AIR CONDITIONING**
•
**COOLING**
•
**VENTILATION**
•
**FACTORY HEATING**
•
**MECHANICAL DRAFT**
•
**FANS and BLOWERS for INDUSTRIAL NEEDS**

*Clarage Fan Company* Kalamazoo, Mich.

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

# THE WORLD'S
## *fastest complete*
# BOILER TUBE SERVICE

● More than 23 years fabricating tubes for all types and sizes of boilers—ample capacity and complete facilities for speed enables us to handle orders in dozen lots or carloads quickly—and to give accuracy and uniformity in each length, in every bend. Write, wire or phone your next order to the "World's Fastest Boiler Tube Service."

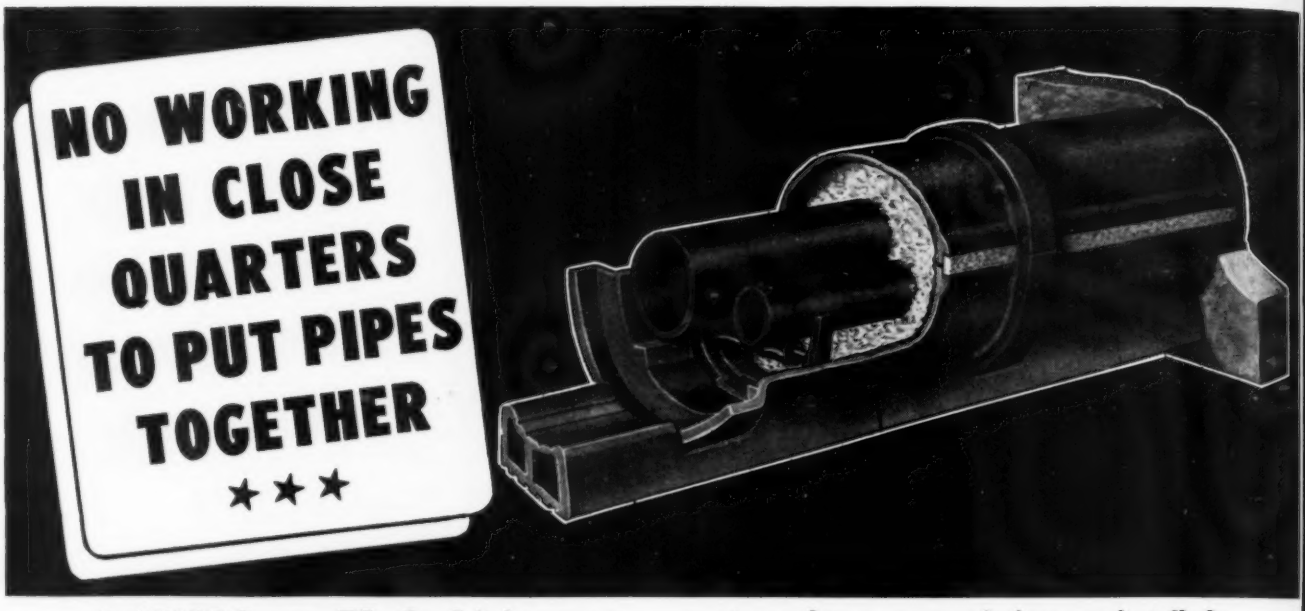
# BOILER TUBE COMPANY OF AMERICA

3126 PREBLE AVENUE
PITTSBURGH, PA.

PITTSBURGH • NEW YORK • PHILADELPHIA • CHICAGO
FRED S. RENAULD & CO. • LOS ANGELES

# ADSCO BANNON TILE CONDUIT

## *Protects underground Pipe Lines*




• ADSCO-Bannon Tile Conduit is so easy to install, that there is no need for highly skilled labor—all too scarce these days. In fact its time-saving features may decide whether the job can be done at all right now. Its split-tile construction is a particular advantage when a group of pipes are installed in one conduit. The pipe can be threaded or welded where you can get at it, then laid on the supports. Support can be furnished for several combinations of pipe in the same conduit thereby reducing costs.

★ ★ ★

## *5 MORE REASONS WHY YOU SHOULD USE ADSCO BANNON CONDUIT*

### *BASE DRAIN*

Carries away ground seepage water. Keeps insulation dry—prevents undue heat loss—prolongs life of the piping.

### *DON'T PAY TO MELT SNOW*

"Fiberglas" Insulation in combination with ADSCO-Bannon Conduit provides excellent insulations. Keep the heat inside where it belongs.

### *SAVES STEEL FOR SOLDIERS*

Clay tile is not a critical material. Except for the pipes in the conduit, the only other metal used is for the pipe supports.

### *PROMPT SHIPMENT*

Order ADSCO-Bannon Tile Conduit and do the job in a minimum of time.

AMERICAN DISTRICT STEAM COMPANY N. TONAWANDA, N. Y.

Making "UP-TO-DATE" Steam Line Equipment for Over 60 Years

### *MOIST CINDERS AND SLAG CANNOT ATTACK IT*

Tile will last indefinitely under these severe conditions, where metals would fail quickly. Bury it and forget it.

**ADSCO**

**BANNON TILE CONDUIT**

Our engineers tell me

*"There'll be no breakdowns from overloads on the equipment these units drive"*

It's another shipment of Philadelphia horizontal type MotoReduceRs, equipped with the exclusive PlaneTorque Safety Feature. When installed on conveyors, agitators, mixers or other equipment where the possibility of breakdowns from jamming or overloading exists, the PlaneTorque cuts off the motor current instantly and automatically, when the overload is reached. The PlaneTorque MotoReduceR may be started again by simply removing the overload . . . no need for resetting switches, etc. PlaneTorque can be furnished on any Philadelphia MotoReduceR, vertical or horizontal, or on the Philadelphia Planetary Speed Reducer. For more details ask for Catalog M.R. 40.

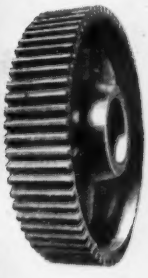
Note—We make speed reducers of all types in a wide variety of horsepowers and reduction ratios.

# PHILADELPHIA GEAR WORKS

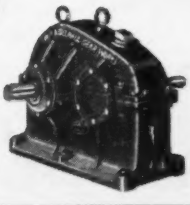
INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

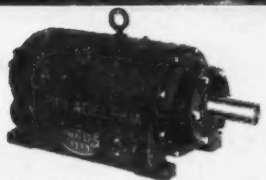
*Philadelphia*
**LIMITORQUE CONTROL**
operates all types of valves, etc., safely, economically, from convenient stations.



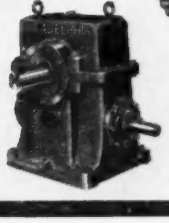
*Philadelphia*
**GEARS**
All types and sizes of industrial gears. Can be supplied in all materials.



*Philadelphia*
**HERRINGBONE SPEED REDUCER**
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



*Philadelphia* MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.



*Philadelphia*
**WORM GEAR SPEED REDUCER**
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

# WATER TUBE BOILERS

*Designed, built and erected*

by Edge Moor

Any practical capacity, pressure and temperature . . . with or without auxiliary equipment, including:

SUPERHEATERS
WATER WALLS
AIR PREHEATERS
ECONOMIZERS
COMBUSTION EQUIPMENT

•

*Edge Moor invites consultation with your engineers*

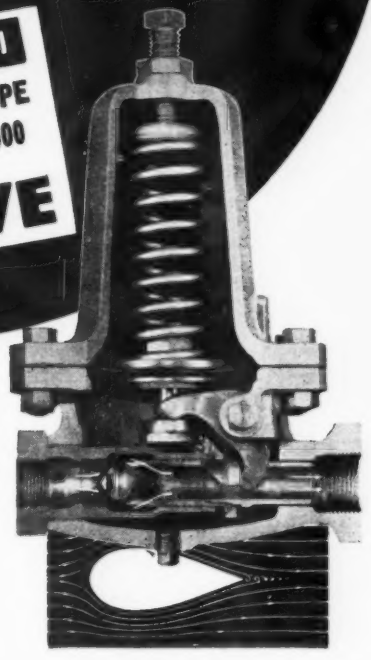
**EDGE MOOR IRON WORKS, INC.** 30 ROCKEFELLER PLAZA NEW YORK, N.Y.

KANSAS CITY CHICAGO DETROIT RICHMOND, VA.

*IN CANADA:—* UNITED STEEL CORPORATION, LTD., TORONTO, MONTREAL

# Like Putting Another SKILLED Man on the Job · · ·

## CASH STANDARD *Streamlined* PRESSURE REDUCING VALVE TYPE 1000



● This Streamlined Type 1000 CASH STANDARD Valve has the ability to not only fully and dependably handle the tough jobs, but to stay on the job and not let things get out of hand. In men they call it "skill."

"We have dozens of these Streamliners," writes a user, "and over a four-year period we have not spent a dime for repair parts. We can put one of these valves in an out-of-the-way place and forget about its being there."

Here's another proof of ability — "Your Streamliners hold constant delivery pressure regardless of variations in demand or supply pressure."

Here's one answer to ability—in the Streamliner design there are no small ports and passages or complicated mechanism and but few close fitting parts.

Bulletin 1000 tells the story — send for it.

*Streamlined*
**FOR SMOOTH EVEN FLOW of Steam, Water, Air, Oil, Etc.**

●

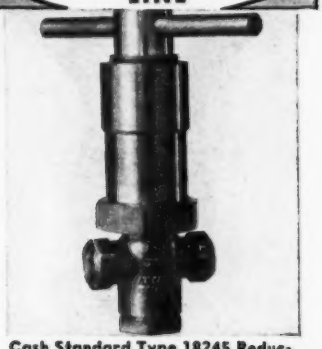
**TURBULENCE ELIMINATED**

That is why you get maximum capacity when it is needed most and accurate pressure control even in times like the present when production keeps going at a high rate.

### *You Get All This*

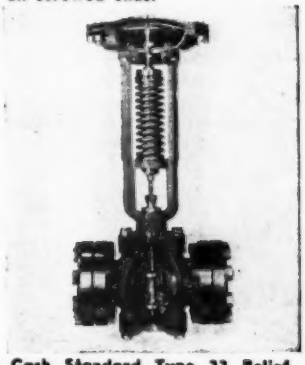
- Trouble-free service
- Smooth operation
- Tight closure
- Accurate regulation
- Elimination of failures
- Constant delivery pressure
- No spoilage
- Practically zero in maintenance costs
- Speedier production results
- Cost saving operation

## OTHER VALVES *from the* CASH STANDARD LINE

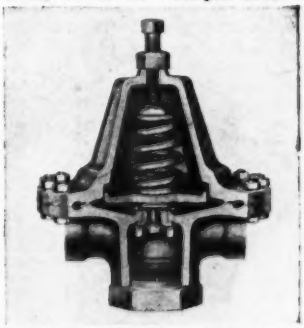


Cash Standard Type 18245 Reducing Valve handles oil or water under high pressures; maintains constant reduced pressure despite variations at inlet. Bronze body, single seat. Trim is nitralloy or stainless steel. Large T-bar handle adjusts discharge pressure.

Initial pressures to 4000 lbs., reduced pressures 500 to 2500 lbs. Sizes ⅜", ¼", ½", ¾" and 1", all screwed ends.



Cash Standard Type 33 Relief Valve; made with diaphragm or piston action, and of various metals to handle nearly all fluids. As indication of the fine mechanism we point to the roller guides for the valve spindle, and the roller bearing which takes care of spring torsion. Sizes ½" to 3" screwed ends, 1" to 12" flanged ends.



Cash Standard Type 8871 Pressure Reducing Valve; for use with liquids—especially dirty liquids, like Bunker C fuel oil for example. No sliding fits; inner valve bolted to diaphragm for positive movement.

Initial pressure up to 250 lbs., reduced pressure up to 200 lbs. Bodies: iron, bronze or steel. Renewable inner valve and seat ring, stainless steel. Sizes: ½" ¾", 1"

**CASH STANDARD CONTROLS .. VALVES**

**A. W. CASH COMPANY**
**DECATUR, ILLINOIS**

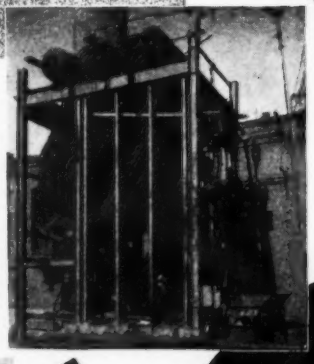
# Vogt

## PRODUCTS ARE

★ DESIGNED to RAISE
★ OPERATING STANDARDS and
★ LOWER YOUR COSTS

### Drop Forged for Safety and Economy under the Most Trying Conditions

Valves, Fittings and Flanges by Vogt—the choice of operating men everywhere for safe and sure regulation of the high pressure and high temperature liquids and gases used in modern process work.



### High Operating Efficiencies and Low Maintenance Costs

More steam per dollar of investment—because Vogt steam generating equipment is designed and built to fit in with specific operating conditions. Vogt boilers are available in bent tube types and straight tube, forged steel sectional header types for solid, liquid, or gaseous fuels, as desired. Three-drum types can be supplied to fit any conditions of restricted installation space.

### Meeting the Demands for Operating Security

Vogt has every facility for the fabrication of stills, towers, continuous rotary filters, filter presses, oil chilling machines, heat exchangers, etc., and these products are serving the petroleum industry around the world.

## Vogt PRODUCTS

For Oil Refineries, Chemical Plants, Power Plants and Related Industries

☆

HENRY VOGT MACHINE CO.

LOUISVILLE, KENTUCKY

NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

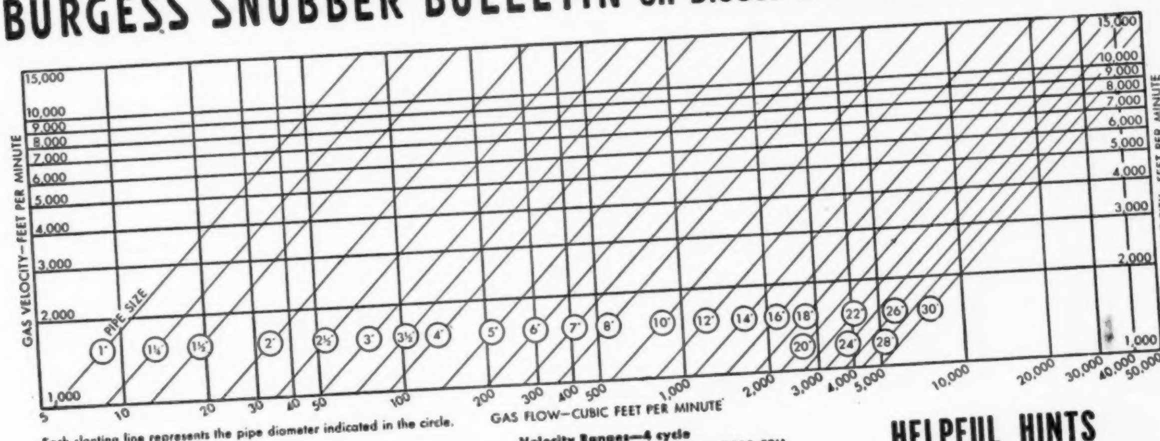
### To Combat Corrosion and Product Contamination

Process equipment made from special metals and alloys for the exacting service of the chemical plant is fabricated in our modern shops for many of the well known chemical companies.

### Steps Tonnage Up and Costs Down

Our experience of more than 50 years in building profit-making ice and refrigerating machinery is at your command. We make complete units for ice and cold storage plants, packing plants, dairies, breweries, chemical plants, oil refineries, etc.

# BURGESS SNUBBER BULLETIN on Diesel Exhaust Noise Control




Each slanting line represents the pipe diameter indicated in the circle.

| Velocity Ranges—2 cycle | |
|---|---|
| Crank Case Scavenged | to 3000 FPM |
| Low Speed Positive Scavenged | 4000-7000 FPM |
| Medium Speed Positive Scavenged | 6000-8000 FPM |
| Medium High Speed Positive Scavenged | 7000-9000 FPM |
| High Speed Positive Scavenged | 8000-10,000 FPM |

| Velocity Ranges—4 cycle | |
|---|---|
| Low Speed | 4000-7000 FPM |
| Medium Speed | 6000-8000 FPM |
| Medium High Speed | 7000-9000 FPM |
| High Speed | 8000-10,000 FPM |

## NEW GAS FLOW CHART SIMPLIFIES CHOICE OF EXHAUST PIPE SIZE

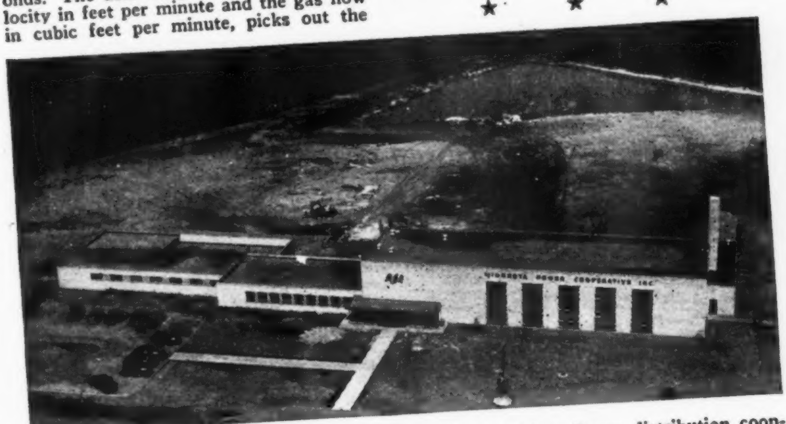
Engine operators and designers frequently have occasion to specify or select engine exhaust pipe sizes. This has always been a complicated job because no simple way of relating pipe size to gas flow had been devised. It was necessary to figure each exhaust pipe individually from a standard formula for gas volume.

After going through a great many tedious calculations to determine proper pipe sizes, Burgess engineers worked out the simple chart shown above which makes the selection of pipe size a matter of seconds. The user simply takes the gas velocity in feet per minute and the gas flow in cubic feet per minute, picks out the point which graphically represents these two values, and the proper pipe size is shown automatically.

This chart is based on the common hydraulic formula $Q = A \times v$. For a round pipe this becomes $Q = \frac{\pi D^2}{4} \times v$, and D can then be found when Q and v are known. Plotting the value of D produces the chart shown above. It may be used to find round pipe sizes for exhaust gas and intake air or for blower air flow.

Copies of this chart, in a form convenient for use, will be supplied to interested persons upon request.

★ ★ ★



## Minnkota, N. D., Cooperative

This new power plant, located in North Dakota, is one of the most attractive of its kind ever built. Financed by REA, it will service thousands of farms lying in the area around it, less than one per cent of which had previously been supplied with electricity. Seven distribution cooperative stations receive power from this plant at high voltage, distributing it to customers at standard voltage.

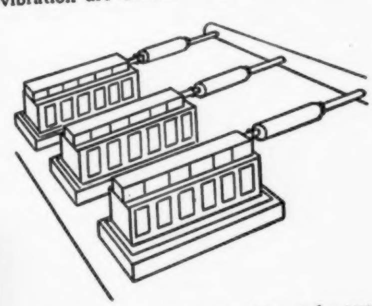
The floor area of the main building is planned to accommodate six 1000 hp Cooper-Bessemer engines, but at present only three are installed. The other three are on order and will be put in place after the war, or earlier if this power source should be needed in furthering the war effort.

Each engine exhaust is equipped with a special 12" combination Snubber and waste heat boiler that eliminates exhaust noise and provides steam. The three units are expected to deliver adequate heat even in severest weather.

## HELPFUL HINTS

### Using Snubbers with an Exhaust Header

While it is often convenient to attach several exhausts to a header, this should not be done unless the exhausts have been quieted first. It can be done successfully when each engine is individually equipped with a Snubber, because the gases then flow smoothly into the header. Oscillation and vibration are eliminated by the Snubber.



One large Snubber should not be used on the header to quiet all engine exhausts because (1) if one or more engines are shut down, the Snubber will not be the proper size for the remainder, and (2) oscillation of gases out of one exhaust pipe into another takes place unless the gases pass through Snubbers before reaching the header. This would result in noise and vibration, and might lower engine efficiency.

An exhaust system with Snubbers like those shown above should operate satisfactorily.

★ ★ ★

Published by ACOUSTIC DIVISION, BURGESS BATTERY COMPANY —2823-L W. Roscoe St., Chicago, U. S. A.

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# VICTORY IS MOVING OVER AMERICA'S POWER LINES!

Today, every kilowatt *counts* as never before. Total war calls for total POWER . . . a fact well recognized by America's power industry, which is performing a notable war service by stepping up production to an all-time high.

## Carey HEAT INSULATIONS

● —perfected through years of research and experience—are providing efficient insulation service in many of the nation's largest public utilities, as well as in industrial power plants of every size. By reducing fuel consumption to a minimum, these durable Magnesia and Asbestos Insulations are making possible the utmost in kilowatt production at lowest operating cost.

● Whatever your needs, you can be sure of getting dependable service with CAREY Heat Insulations. Our nation-wide distribution and engineering organization is available at all times. Catalog mailed on request—address Dept. 16.

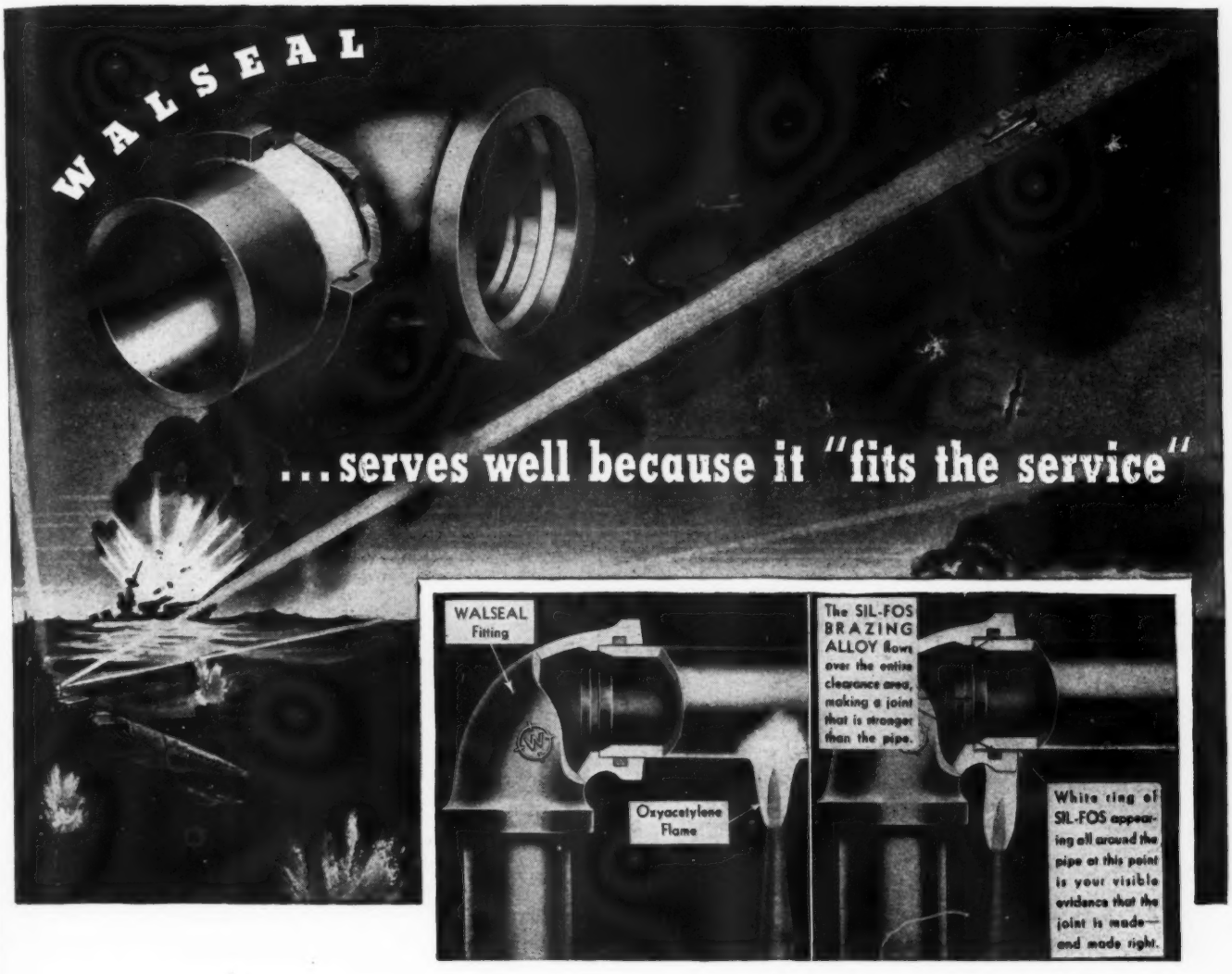
85% Magnesia
For High and Medium Pressure.

Combination Hi-Temp—85% Magnesia.

Hi-Temp Blocks
For Furnaces, Ovens, Kilns, etc.

Careysel Insulation
For temperatures up to 500°F.

THE PHILIP CAREY MFG. COMPANY
DEPENDABLE PRODUCTS SINCE 1873 — LOCKLAND, CINCINNATI, OHIO
In Canada: The Philip Carey Company, Ltd. — Office and Factory: Lennoxville, P. Q.


WALSEAL
...serves well because it "fits the service"
WALSEAL Fitting
Oxyacetylene Flame
The SIL-FOS BRAZING ALLOY flows over the entire clearance area, making a joint that is stronger than the pipe.
White ring of SIL-FOS appearing all around the pipe at this point is your visible evidence that the joint is made—and made right.

Vibration proof, corrosion resistant, and leakproof! Yes, a Silbraz Joint made with Walseal Flanges, Fittings, or Valves has the inherent stamina to withstand the incessant shaking, the moisture, the changing temperatures, and inevitable knocks of war-time service. Tens of thousands of Walseal products are proving beyond dispute that they truly make a "one-piece pipe line." A Silbraz Joint cannot creep or pull apart under any temperature to which brass or copper pipe can be safely subjected.

Today Walseal is "all out" for war. In the peace to come the use of Silbraz Joints for assembling non-ferrous piping will continue to expand. Walseal Flanges, Fittings, and Valves have the added advantage of being installed easily even in cramped quarters.

You'll find complete information on Walseal products in the new Walworth Catalog 42 on pages 230 to 242, inclusive.

• • •

If you want a copy of this up-to-date catalog of Walworth Valves, Fittings, Pipe, and Pipe Wrenches, write for it on your business letterhead. Address: Walworth Company, Dept. 55, 60 East 42nd St., New York, N. Y.

BOSTON WORKS
KEWANEE WORKS

# WALWORTH
## valves AND fittings

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

# ONE of FOUR

## Surface Condensers
## Totaling 122,000 Square Feet

Typical of larger surface condensers designed and built by Lummus is this 36,000 square foot unit for a well-known public utility. Precision workmanship in the Lummus Company plant will facilitate easy and accurate assembly in the field.

All Lummus condensers are equipped with air ejectors designed and built by Lummus.

**DESIGN FEATURES**
**LUMMUS SURFACE CONDENSERS**

- Streamlined Tube Layout
- Internal Air Cooling Section
- Deaerating Hotwell

**RESULTING IN —**

- Minimum Pressure Drop
- Minimum Condensate Depression
- Minimum Condensate Oxygen Content
- Minimum Air Ejector Steam Requirements

THE LUMMUS COMPANY · 420 LEXINGTON AVE., NEW YORK, N.Y.

# LUMMUS

# BARTLETT • SNOW'S SIX STANDARD LAYOUTS REDUCE BOILER PLANT COAL HANDLING COSTS

● Engineers and boiler plant officials who are desirous of minimizing the charges for new engineering . . . so that the maximum amount of the appropriation can be expended for actual plant facilities . . . will find the Bartlett-Snow layouts ideally suited for their purpose. Each represents an actual installation of proven fitness for that size of plant . . . can be installed in existing or new buildings . . . and altered to meet the requirements of a variety of yard and track conditions.

Complete facilities are provided, including track hoppers, skip hoists, bunkers, weigh larries, and even field storage and ash handling, if desired. The systems combine maximum dependability with low maintenance and low operating costs . . . will incur a minimum of "starting-up" adjustments. Full details will be found in Bulletin 83. Send for one.

**THE C. O. BARTLETT & SNOW CO.**
**6205 Harvard Avenue** **Cleveland, Ohio**
*In New York—* 30 Church Street
*In Chicago—* First National Bank Bldg.

●

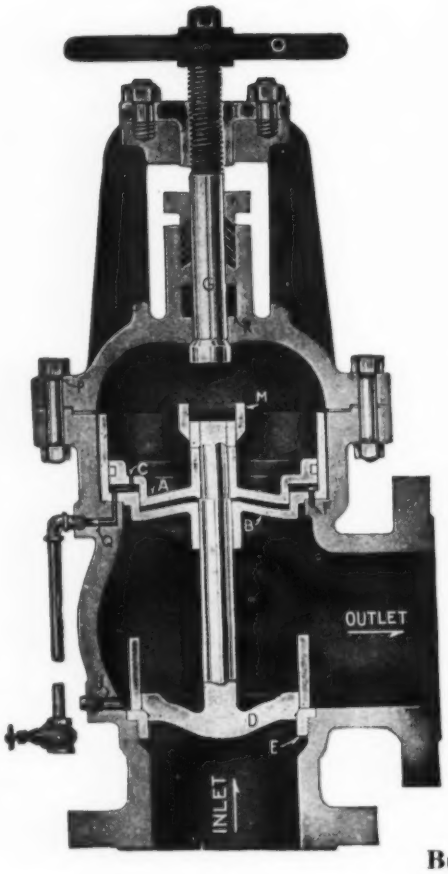
**BULLETIN NO. 83**

Complete with 44 diagrams, 12 tables, 90 illustrations describes the Bartlett-Snow method of securing less costly—more efficient operation. Send for one.

# BARTLETT • SNOW
## *Coal and Ash Handling Equipment*

TRACK HOPPERS • LOADING GATES • SKIP HOISTS • HOIST ENGINES
BUNKERS • WEIGH LARRIES • ASH HOPPERS • FIELD STORAGE

# GOLDEN-ANDERSON SPECIALTY VALVES




## . . . *Tested for strain far beyond operating capacity*

• **Remote as they may seem, breakdowns and service delays are ever-present enemies of your power-process and pressure lines. To aid you in guarding against "down-time" GOLDEN-ANDERSON has, for nearly 40 years specialized in the design and development of "Emergency" valves. Before any G-A Valve leaves our plant it undergoes rigid and severe tests . . . inspection that proves each valve's ability to cope with service requirements far beyond rated capacity. Get in touch with GOLDEN-ANDERSON *now* . . . regardless of your operating requirements, there is a G-A Valve that will fill the bill. Write today for our new illustrated catalog . . . contains complete specifications on all G-A Specialty Valves.**

**Bursting steam lines and boiler explosions are distinct possibilities under today's full-capacity operations. Protect life and property with the G-A Non-Return Valve . . . automatically isolates a boiler whenever boiler-pressure, from any cause, is less than line-header pressure. Furnished double extra heavy throughout, these valves are the heaviest of their kind. Supplied with either flanged ends or welded necks . . . handles 150 to 1500 lbs. In angle, globe or elbow types from 2½" to 16" sizes.**

***also***

*Altitude Control . . .*
*Pressure Reducing . . .*
*Throttle and Emergency Stop . . .*
*Check Valves, etc.*

●

**GOLDEN-ANDERSON VALVE SPECIALTY CO.**
**FULTON BLDG. PITTSBURGH, PA.**

**SUPER-SEAL PLASTIC PACKING REMOVES "HIT AND MISS!"**

This is an unretouched photo of Super-Seal No. 1 with Microtyne graphite lubrication—an example of John Crane precision manufacture . . . Note the non-fracturing flexibility, even though unjacketed and—it has "spring-back" resilience! . . . Standardize on Super-Seal for all your services. There are 6 all-inclusive styles, many of them "double-duty" styles which render multiple services.

**Super-Seal No. 1 . . . John Crane Plastic Packing**

**Equipment** . . . Pumps: centrifugal, boiler-feed and rotary . . . steam rods . . . valve stems.

**Service** . . . General utility: steam, water, air.

**Construction** . . . Manufactured from special long-fibre, pure asbestos with babbitt particles; special binder. New John Crane process dry-graphitizes every fibre and metal particle, insuring anti-frictional wearing face. No volatile oils—nothing to be squeezed out or boiled out; no drying, hardening.

# *Change your* PACKING —STEP-UP *pumping efficiency*

## *Call* JOHN CRANE

*OFFICES AND STOCKS FROM COAST TO COAST — SEE YOUR LOCAL DIRECTORY*

• • •

BALTIMORE • BUFFALO • BOSTON • CLEVELAND
DALLAS • DETROIT • HOUSTON • LOS ANGELES
NEW ORLEANS • NEW YORK • PHILADELPHIA
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• • •

CRANE PACKING COMPANY
1800 Cuyler Avenue, Chicago
CRANE PACKING CO. LTD. Hamilton, Ontario, Canada
*Branches: Montreal, Toronto, Vancouver*

*BUY ANOTHER BOND NOW!*

There is no time now to redesign or replace pumps. But neither need you put up with trouble and production loss. It *can* be remedied . . . Often a switch to a more suitable packing style gives complete relief If—you consult *qualified experience* to diagnose the case . . . John Crane's 302 scientific styles of packing tailored to their specific jobs, a modern laboratory for special problems and an experience-file of tens of thousands of corrections—are all at your finger tips—to *keep 'em pumping* . . . Ring the branch office nearest you.

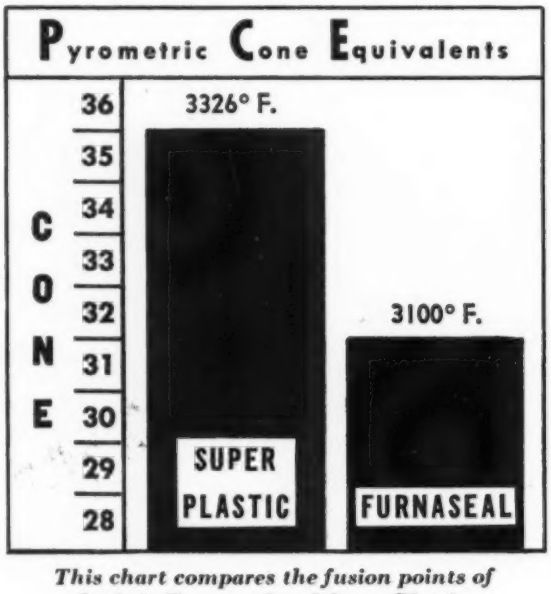
# LACLEDE Engineering Service Can Save Time for Power Engineers

The increased tempo of operation in nearly all industries has created a condition in power plants that puts refractories to a severe test. Because of this unusual strain, it is more important than ever before to select the right refractory for the job to be done.

A Laclede-Christy engineer can save you time by helping you to do that quickly. This is possible because of Laclede-Christy's complete line of fire brick and high temperature specialties and the long experience in solving refractory problems—which enables the engineers to make an unbiased recommendation.

Today, when you are busier than ever before, let a Laclede-Christy engineer help you with your refractory problems. Let him save you time in selecting the right refractory which will save you still more time by keeping your equipment on the job longer — saves repair and maintenance time, cuts costs, and keeps production up.

## LACLEDE FURNASEAL and SUPER PLASTIC *are Solving Many Refractory Problems*




*This chart compares the fusion points of Laclede Furnaseal and Super Plastic*

Either of these two plastic refractories may be used for making quick, economical repairs or complete monolithic settings. Laclede Furnaseal —a first quality plastic (PCE 3100° F.)—is low in shrinkage and has the ability to bear load under heat. SUPER PLASTIC is a super-duty plastic (PCE 3326° F.—3362° F.) for conditions too severe for first quality plastic or fire brick. Send for complete engineering information on these two time and money-saving refractories.

Consult the classified section of your 'phone book or write for the name of your Laclede-Christy representative.

LACLEDE-CHRISTY FOUNDED 1844 ST. LOUIS, U.S.A.

**LACLEDE-CHRISTY**
**CLAY PRODUCTS COMPANY**
**Ambassador Bldg., St. Louis, Missouri**

*World's Largest and Most Diversified Line of High Temperature Refractory Specialties*

# When Johnny, Mike, Pete and Mary

## *come marching home!*

THAT will be the Great Day when the victorious boys—and the girls—come back to the wide open arms of America.

A Great Day that isn't so far away.

They probably haven't realized it but Industry has found the time somehow, apart from its tremendous war effort, to plan and develop new things that will enhance and improve our future living.

New developments in metals and alloys, fuels, plastics, chemicals, rubber, foods, synthetics, textiles—and electronics which will be reflected in the coming higher standards of peace-time living.

Right now in thousands of laboratories—in pilot plants—on the drawing boards—in the conference rooms—Industry is experimenting, planning, discussing.

And in many of these almost revolutionary processes that are already under way or are being planned, super refractories by Carborundum are considered as vitally important factors.

If you, too, are working on or considering a new process involving the use of refractories, there is undoubtedly one or more Carborundum Brand Super Refractories that will improve the efficiency of your operation.

It may be that your conditions call for a refractory having high refractoriness or high heat conductivity.

Perhaps resistance to spalling or softening or great strength at elevated temperatures is most important.

Whatever the essential quality, characteristic or application may be, we are confident that super refractories by Carborundum and our research and engineering will prove invaluable.

We would welcome the opportunity of consulting with you.

REFRACTORY CARBORUNDUM PRODUCTS

*Refractory Division,* **THE CARBORUNDUM COMPANY,** *Perth Amboy, N. J.*

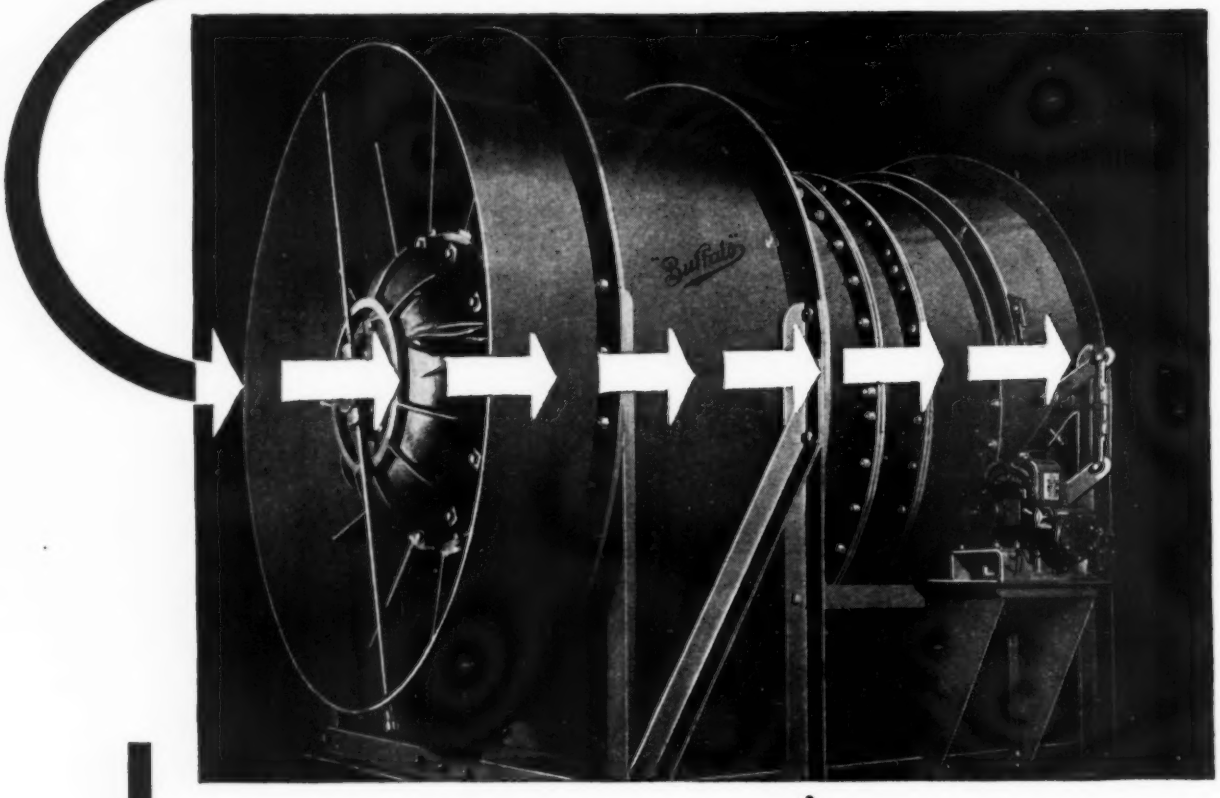
REG. U. S. PAT. OFF.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

# AIR TAKES THE *Straightaway*




## In power-saving... "Buf-flow" AXIAL FLOW FANS

The "straightaway" flow of air through a "Buf-flow Axial Flow Fan — plus the non-rotating movement of the air current as it leaves the outlet - - explains both the efficiency and the power-saving features of this Buffalo-developed design. The wasted motion of air turbulence is reduced to a minimum by means of special directional guide vanes, thus preventing losses common in ordinary propeller fan. The result is an exceptionally high capacity operating against pressure losses, quieter operation, marked power savings. These advantages — plus the sturdy, durable construction and the non-overloading characteristic — makes Buf-flow Axial Flow Fans unexcelled for air handling problems.

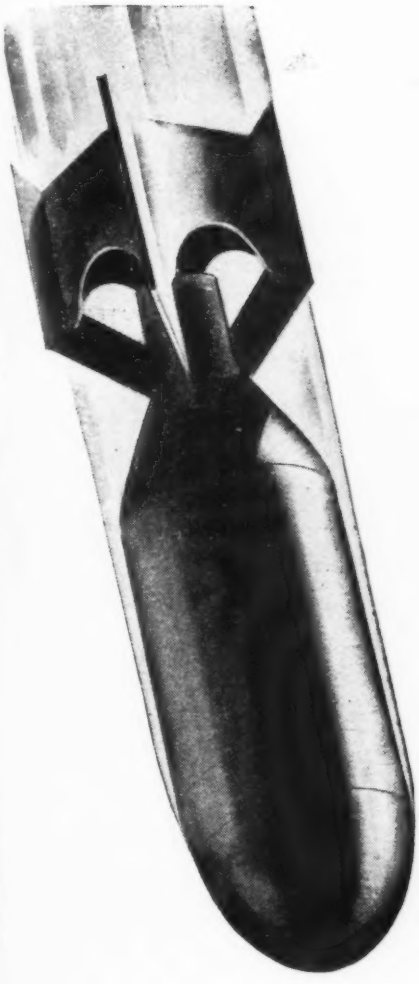
ARMY E NAVY

**BUFFALO FORGE COMPANY**

488 Broadway — Buffalo, N. Y.

Branch Engineering Offices in Principal Cities
Canadian Blower and Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **FANS FOR INDUSTRY**



# Stick around... and watch this change into a vacuum cleaner

IT may even turn into a toothbrush. Or the all-plastic body for your next car.

But whatever else this explosive manufacturer decides to make after the war, it won't be bombs. And at the rate chemistry is advancing, it could be almost anything—from metal-less baby carriages to nylon stockings!

If he's using Taylor Instruments, his problem will be a whole lot easier. The same Taylor automatic controls that helped him convert to war production can help him convert again to almost any peacetime product he wants to make!

And that goes for you too. The same inherent flexibility that makes Taylor Instruments so acceptable for processing operations—their unit construction and interchangeability of parts—make them equally desirable in the power field. For example, after the war your load requirements may be entirely different!

Meanwhile, if instruments can help you speed your part in the war effort, call the Taylor Field Engineer. Remember, any Taylor instrument you buy now will be a permanent investment—for your own and your country's future! Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada. *Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow and liquid level.*

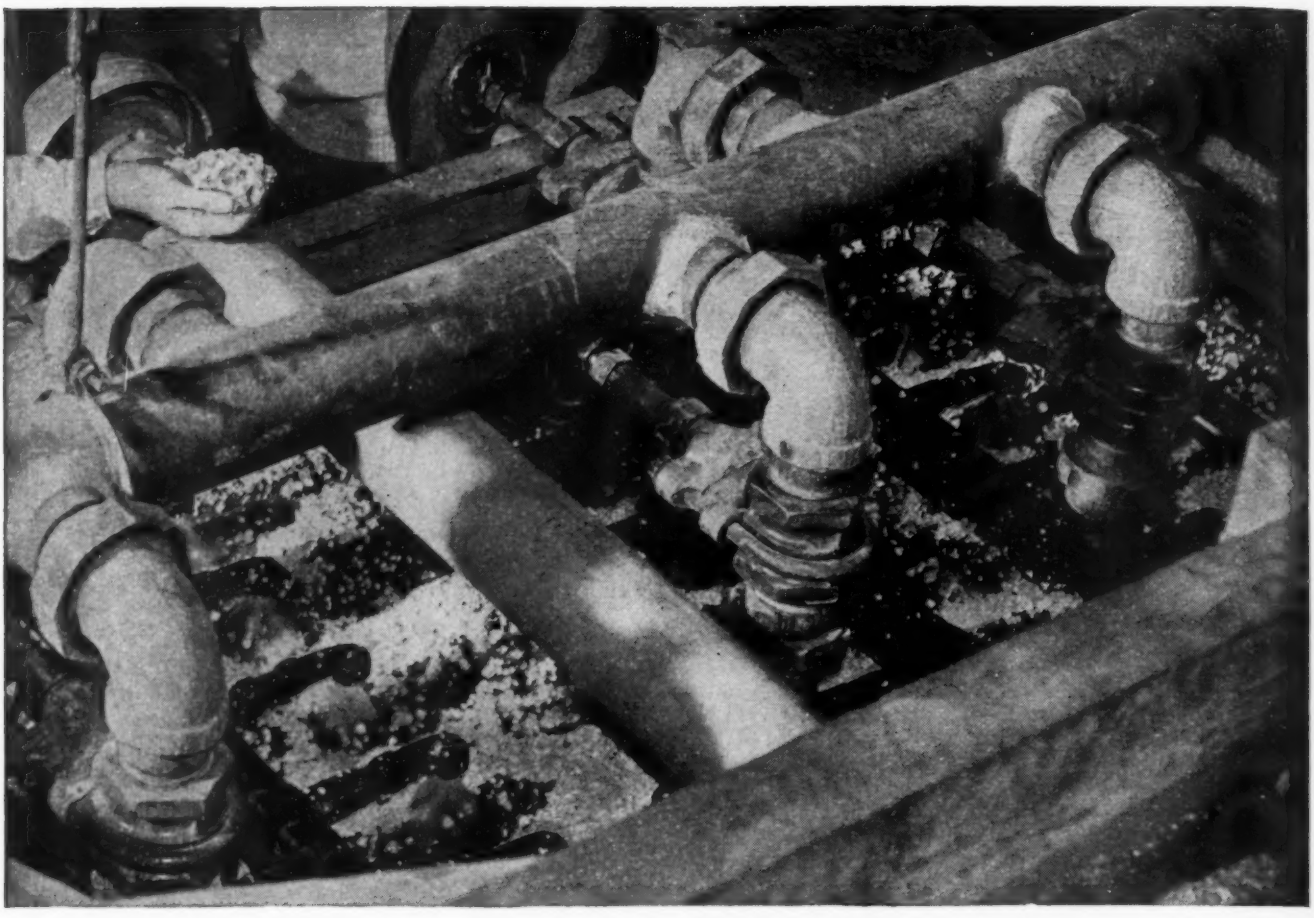
**Taylor Instruments**

**MEAN**

**ACCURACY FIRST**

**IN HOME AND INDUSTRY**

★ KEEP ON BUYING U. S. WAR BONDS AND STAMPS ★



# OUT OF THESE FLOCS MAY COME THE FUTURE OF THE WORLD

These white crumbs or "flocs" look very unimportant in themselves . . . but on them may depend the future of the world. They are one of the first stages in the production of synthetic rubber, the most vital material being produced in America today.

Naturally, you are interested in synthetic rubber. But synthetic rubber is only incidental. What is really important is what happens to synthetic rubber after it is actually produced. It is chemistry that makes rubber fit to use, suits it to the task at hand.

United States Rubber Company is the largest manufacturer of rubber chemicals in the world. We have worked with rubber, improved it and broadened its uses for 100 years. Today, all this tremendous fund of knowledge of the chemistry of rubber is being drawn upon to improve synthetic rubber, perfect it for the jobs it must do for the Armed Forces and war industry.

The chemistry of rubber is what determines the final compounding and processing of the flocs of synthetic rubber you see here. They may eventually go into bullet-sealing hose, air ducts, or any one of a score of other parts used in the plane that will blast the last Nip carrier off the sea. They may be made into a tire that will rumble down bomb-battered Unter den Linden. They may go into some essential equipment like a conveyor belt that will keep America's war production line moving at top speed. They might very easily determine the entire course of the war, and thereby the future of the world.

Synthetic rubber, its production, compounding and application to war and industrial uses, is too big a story to present adequately here. There are five basic commercial types of synthetic rubber. Each of them has distinct properties and characteristics. Not a single one is ideal for all purposes.

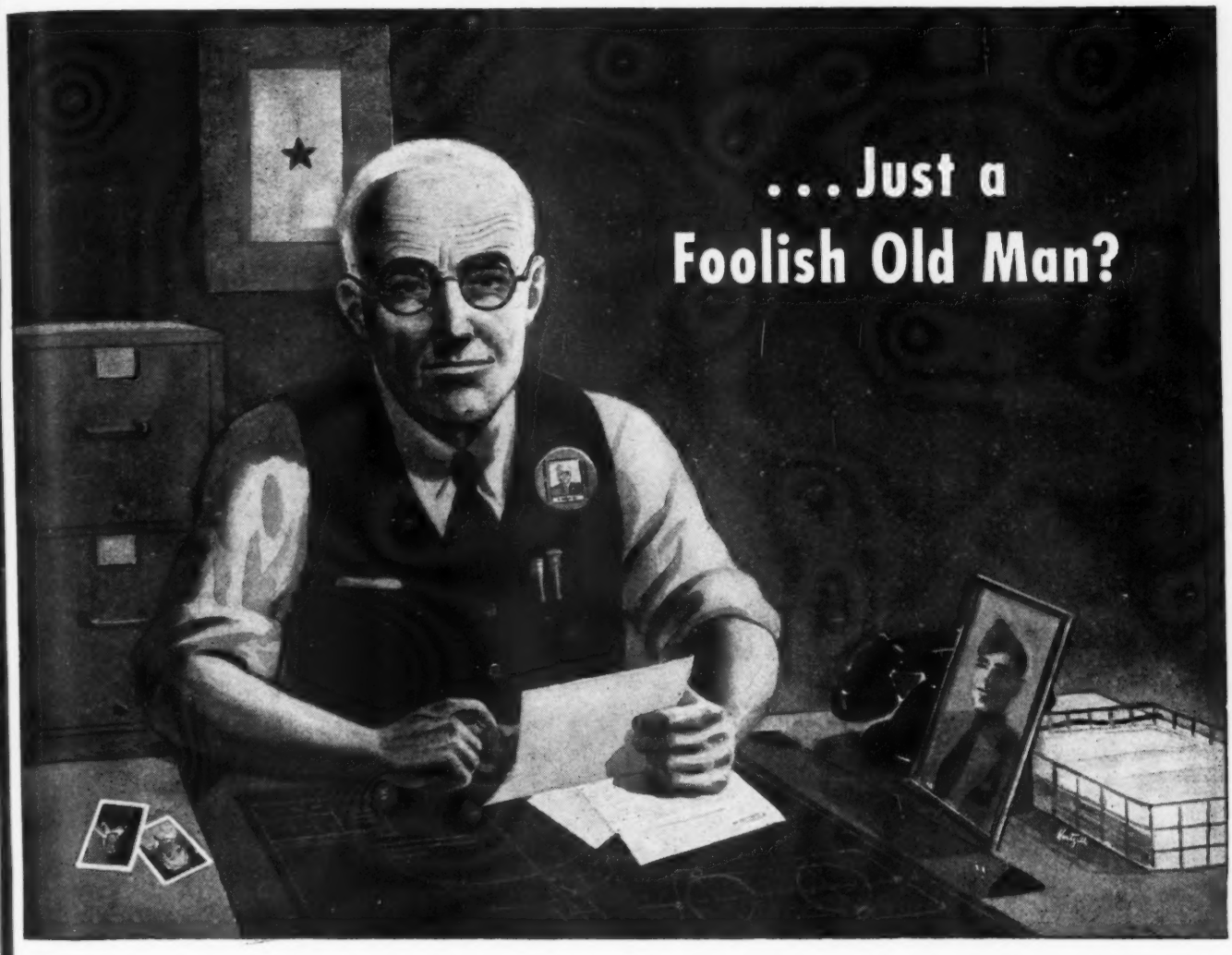
Deciding which synthetic rubber to select and use for a particular task is an equally big story, a decision that requires expert knowledge and broad range experience.

We have told the story of the five basic commercial types of synthetic rubber, our more than twenty years of experience in working with them, and our twelve years of using synthetic rubber commercially in an interesting, informative booklet for business executives. Please ask for your copy on your regular business letterhead.

## UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK

In Canada: Dominion Rubber Co., Ltd.




I COULD be on the sidelines, taking things easy, and maybe I should be. Maybe I should have quit my job last year, and started loafing on what I've saved. But, you see, I've got two boys and some grandchildren that mean a lot to me.

One of my boys, the youngest, is in the Army. The other one is married, and has a couple of kids. Like me, he is doing war work. So, even though I may be just a foolish old man, I can't help but feel a responsibility to my grandchildren, and to my grown-up sons.

Yes, I feel I should be doing something to help win this war so that my grandchildren and all kids can grow up, as I did, in a world that's free, like America, from want and hate and fear.

I want to see my son in the Army come marching home as soon as possible, too. And that's why I'm not taking it easy. That's why I'm working hard here at Morse. Maybe I'm foolish—thinking that I can help win the war—my job isn't big and important. But just the same there's always a chance that I might help produce a drive part that will save my boy's, or your boy's, life . . . there's a chance that something I do here at Morse might help win the war a fraction of a second sooner. And that's why, old as I am, I keep working.

*THE MEN who work at Morse have the satisfaction of knowing that they are producing equipment vitally needed by our armed forces . . . equipment used in tanks, guns, ships and planes . . . and in their manufacture.*

*Of course, we know that Morse products, alone, won't win the war . . . but they are, on the other hand, helping a lot where needed. And with Americans, and American Industry, making an all out effort . . . the Axis is due for a terrific shellacking.*

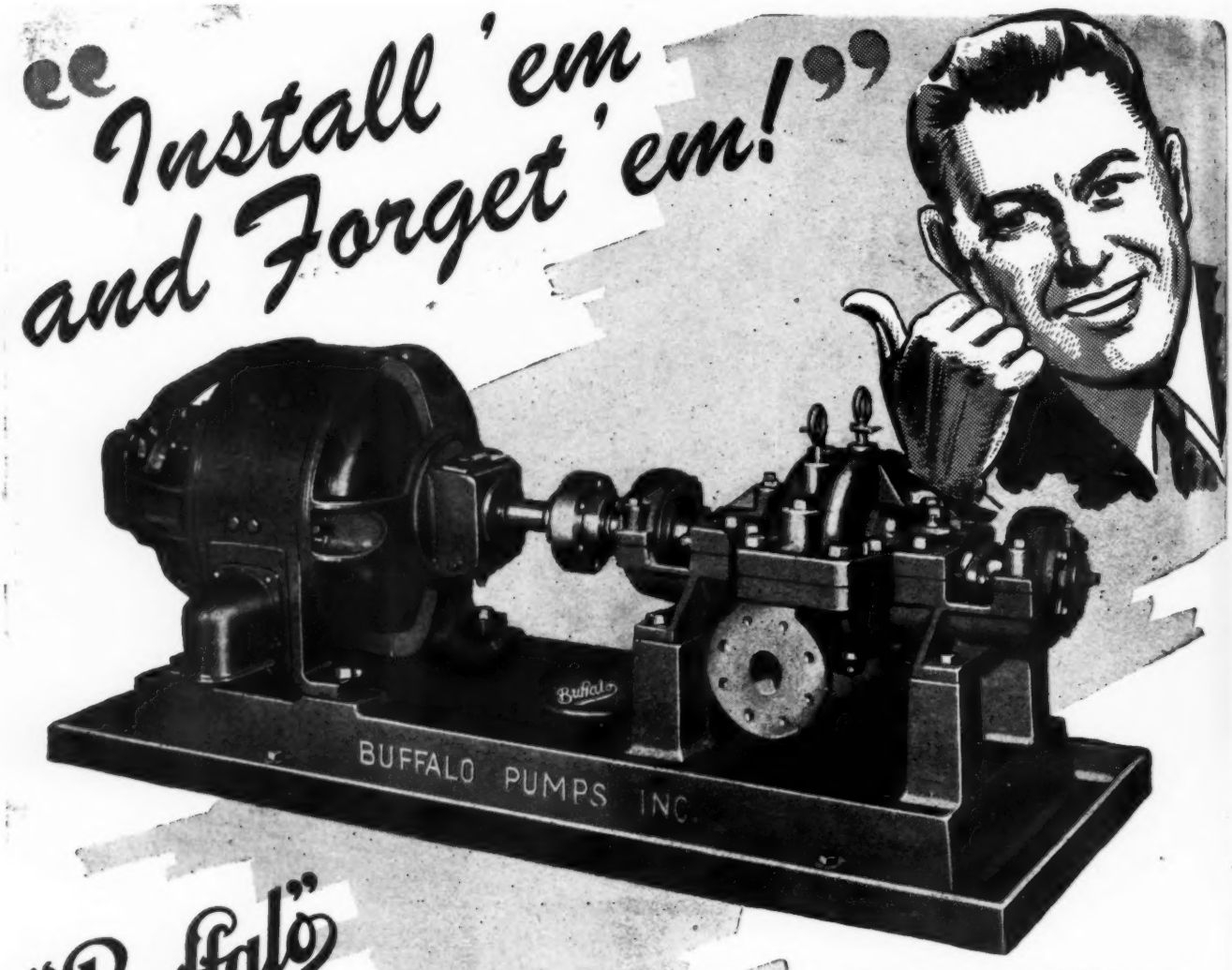
**Your nearby Morse engineer can help you to solve your power transmission problems. He will be especially eager to do so if your problem is concerned with war production. Morse, with more than forty years' experience in the manufacture of power transmission equipment, makes silent chains, roller chains, sprockets, Morflex Couplings, radial couplings, silent chain couplings, roller chain couplings, free wheeling clutches, Pullmore multiple disc clutches, silent automotive timing chains, marine reduction gears and special drives engineered to the job. Inquiries are invited.**

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

**MORSE *positive* DRIVES**

MORSE CHAIN COMPANY ITHACA, N. Y. DETROIT, MICH. DIVISION BORG-WARNER CORP.

# "Install 'em and Forget 'em!"




## "Buffalo" GENERAL SERVICE PUMPS

*...ask for Practically no servicing*

The way Buffalo Pumps go about their jobs ceaselessly, without coaxing and with so little servicing, is winning for them new praise from hundreds of operating men. That's because "dependability" is built into every Buffalo Pump from the drafting board up. Designed by experts, constructed by experts, tested and okayed by experts, every Buffalo Pump is a high-efficiency unit exactly matched to its task—with a big margin of extra performance left over. In war, as in peace, Buffalo Pumps deliver the goods!

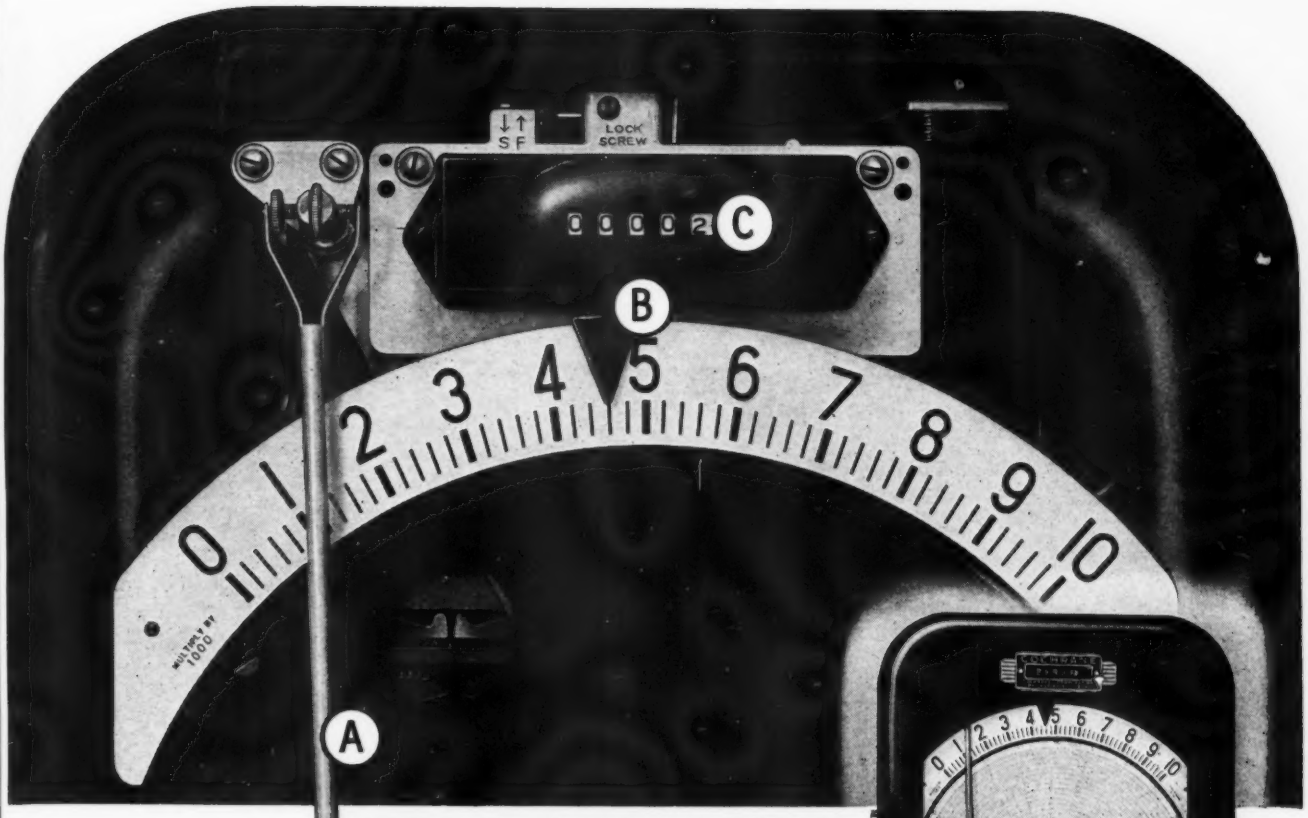
ARMY E NAVY

**BUFFALO PUMPS, INC.**

490 Broadway Buffalo, N. Y.

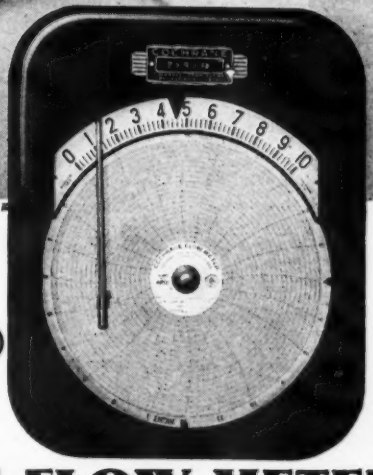
*Branch Engineering Offices in Principal Cities*
Canada Pumps, Ltd., Kitchener, Ont.

★ "Buffalo" PUMPS ★



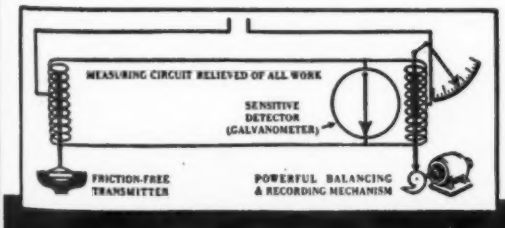

# It takes POWER

**to move this rugged pen arm (A)**
**this big red pointer (B)**
**this accurate integrator (C)**



## BUT in the COCHRANE FLOW METER THE MEASURING CIRCUIT DOES NONE OF THIS WORK

You need strength and ruggedness in a commercial flow meter, combined with extreme sensitivity and accuracy. Where the measuring circuit also provides the power for indicating, integrating and recording, these parts must be relatively light. In the Cochrane Flow Meter, the sensitive measuring circuit is relieved of all work, an auxiliary motor furnishing the power for the work to be done. That is why the Cochrane pen arm is big and sturdy with a large pen capable of carrying a month's supply of ink. The indicator pointer is big, easy to see, and always accurate. The integrator is positive and mechanical, not magnetic in operation.


MEASURING CIRCUIT RELIEVED OF ALL WORK
SENSITIVE DETECTOR (GALVANOMETER)
FRICTION-FREE TRANSMITTER
POWERFUL BALANCING & RECORDING MECHANISM

By relieving the measuring circuit of all work and by providing an external source of power, the Cochrane Flow Meter fulfills the formula:

$$\text{ACCURACY} = \frac{\text{POWER}}{\text{friction}}$$

**COCHRANE CORPORATION • 3106 N. 17th STREET • PHILADELPHIA**

# COCHRANE
## FLOW METERS

IF you are as busy and hard pressed as are most of the power plant engineers engaged in war industries, the words "Help Wanted" have an important meaning. If you ever needed help, it is now.

You need help in manpower . . . workers you can rely on who know what to do and how to do it. You need help in maintenance. Equipment keeps giving out and is hard to replace. You need help in steam output. It never seems quite enough for your needs.

Hagan Control offers a very satisfactory solution to all three problems.

For Hagan Automatic Combustion Control can take the place of the skilled manpower you find it so hard to get—do it reliably 24 hours a day, year in and year out. It will go a long way toward running those boilers of yours and do it dependably with a mechanical accuracy and speed the human hand can't match.

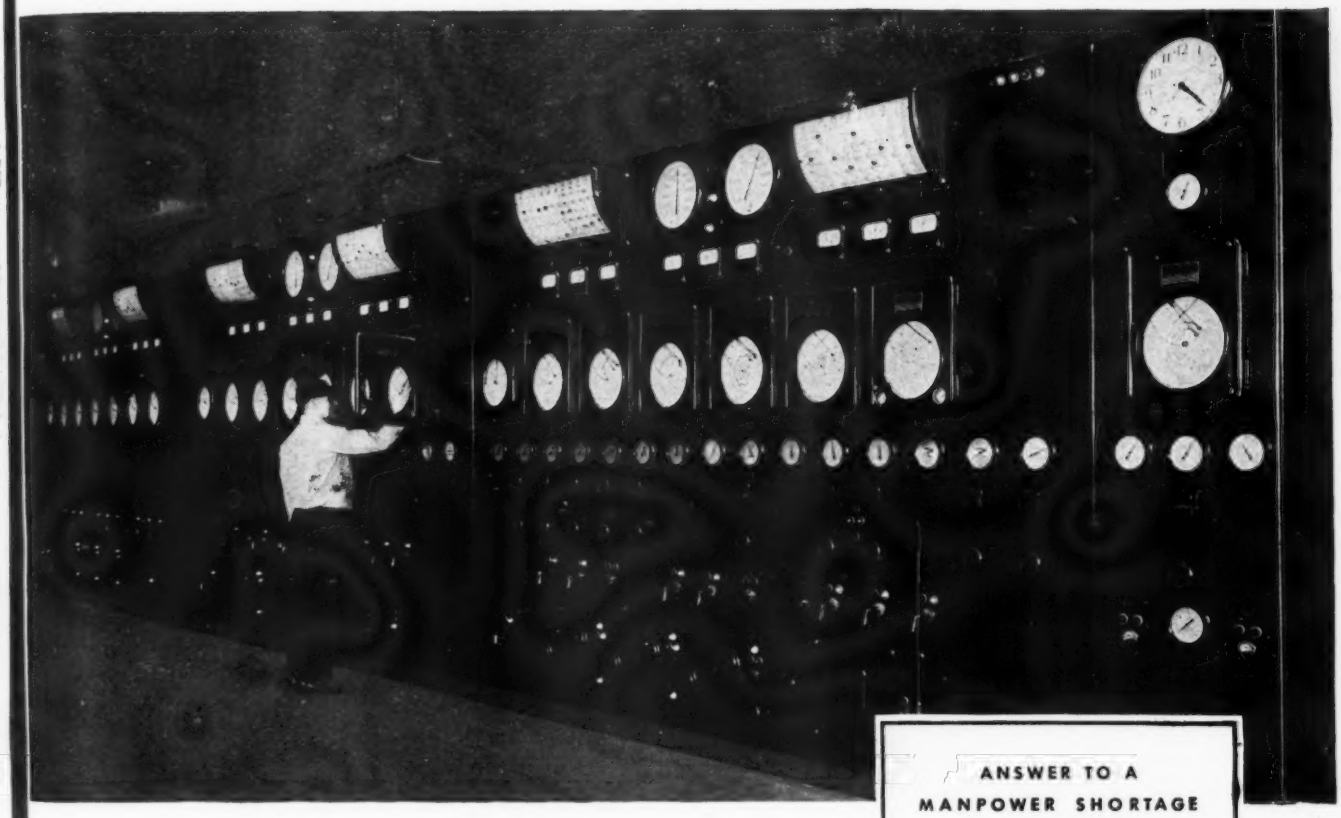
It will give maximum protection to your auxiliary parts—fans, stokers, etc., by maintenance of correct operating conditions.

It will increase your steam output directly, because regardless of other means employed to increase boiler capacity, Hagan Control, by adjusting all auxiliaries for maximum output, will insure maximum steam from every pound of fuel whatever the fuel you use.

Those are a few of the reasons why thousands of power plant engineers facing a war emergency are thankful today for their foresight in installing a Hagan Control System. There are many more and they are all important.

Let us show you why it will pay to take down the "Help Wanted" sign and let Hagan Control do the job.

# et Hagan Automatic Control take the job!



## HAGAN CONTROL ASSURES

**MAXIMUM QUANTITY** of steam from any given plant, by introducing fuel and air in correct proportion for utmost efficiency.

**MAXIMUM UTILIZATION** value, uniform steam pressure and temperature, in accordance with demand.

**MAXIMUM OUTPUT** from boilers of differing capacities, automatically.

**MAXIMUM STEAM** for production, by reducing loss of steam in frequent soot-blowing.

**MAXIMUM PROTECTION** of auxiliary equipment, fans, stokers, etc., by maintenance of uniform operating conditions.

**ANSWER TO A MANPOWER SHORTAGE**

*The Hagan Combustion Control system represented by this panel keeps boilers producing at peak efficiency regardless of whether your best operators have gone to war. It enables you to break in new men easily by relieving them of the necessity of making hundreds of small adjustments daily.*

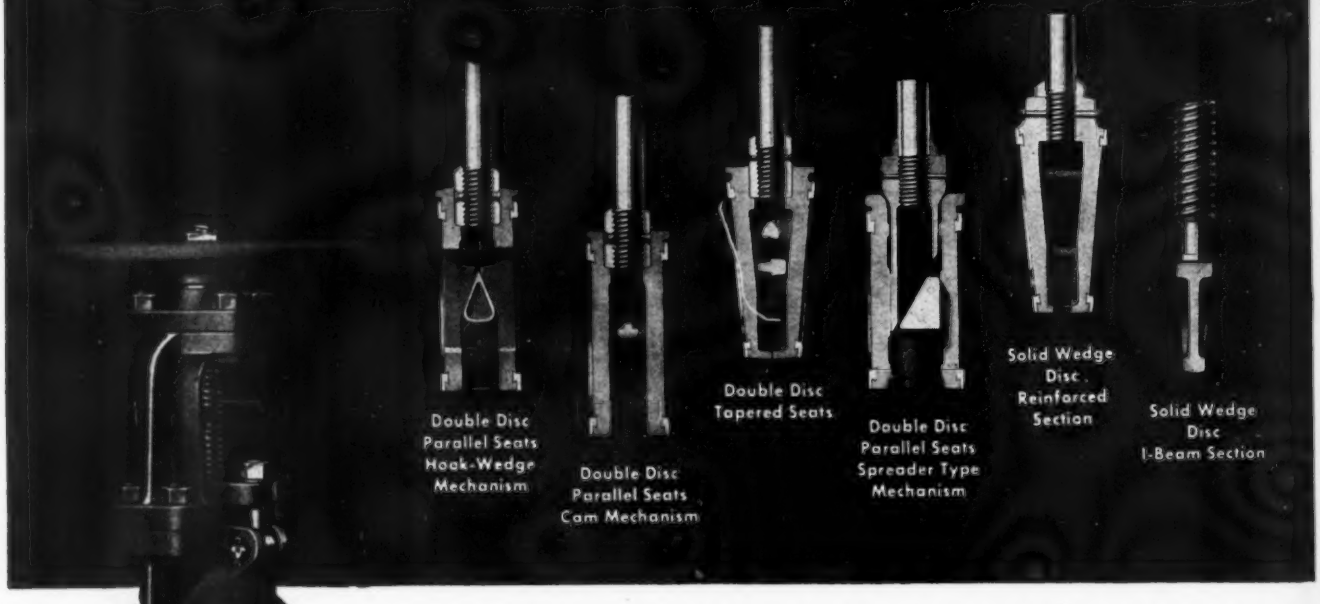
HAGAN
HALL
BUROMIN
CALGON

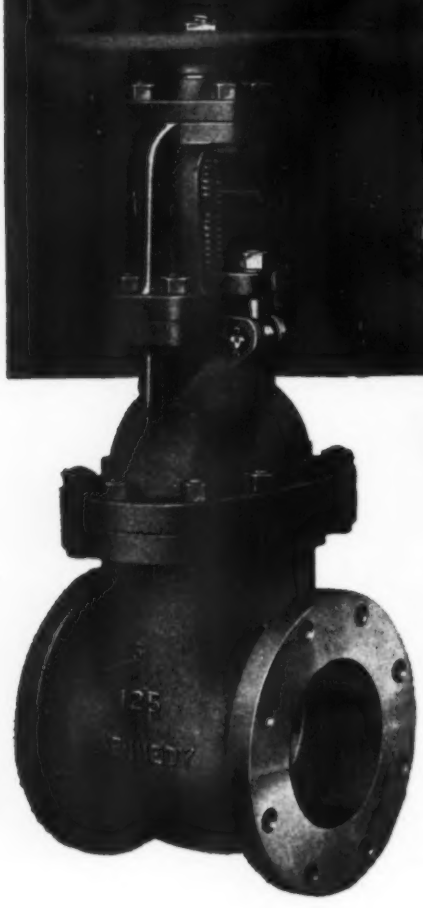
**HAGAN CORPORATION · HAGAN BUILDING · PITTSBURGH, PA.**

**HAGAN *Automatic* COMBUSTION CONTROL**

*The pioneer . . . and still the leader*

# GATE VALVE DISCS



## WHAT'S YOUR PREFERENCE?

### *They're all in the KENNEDY line*

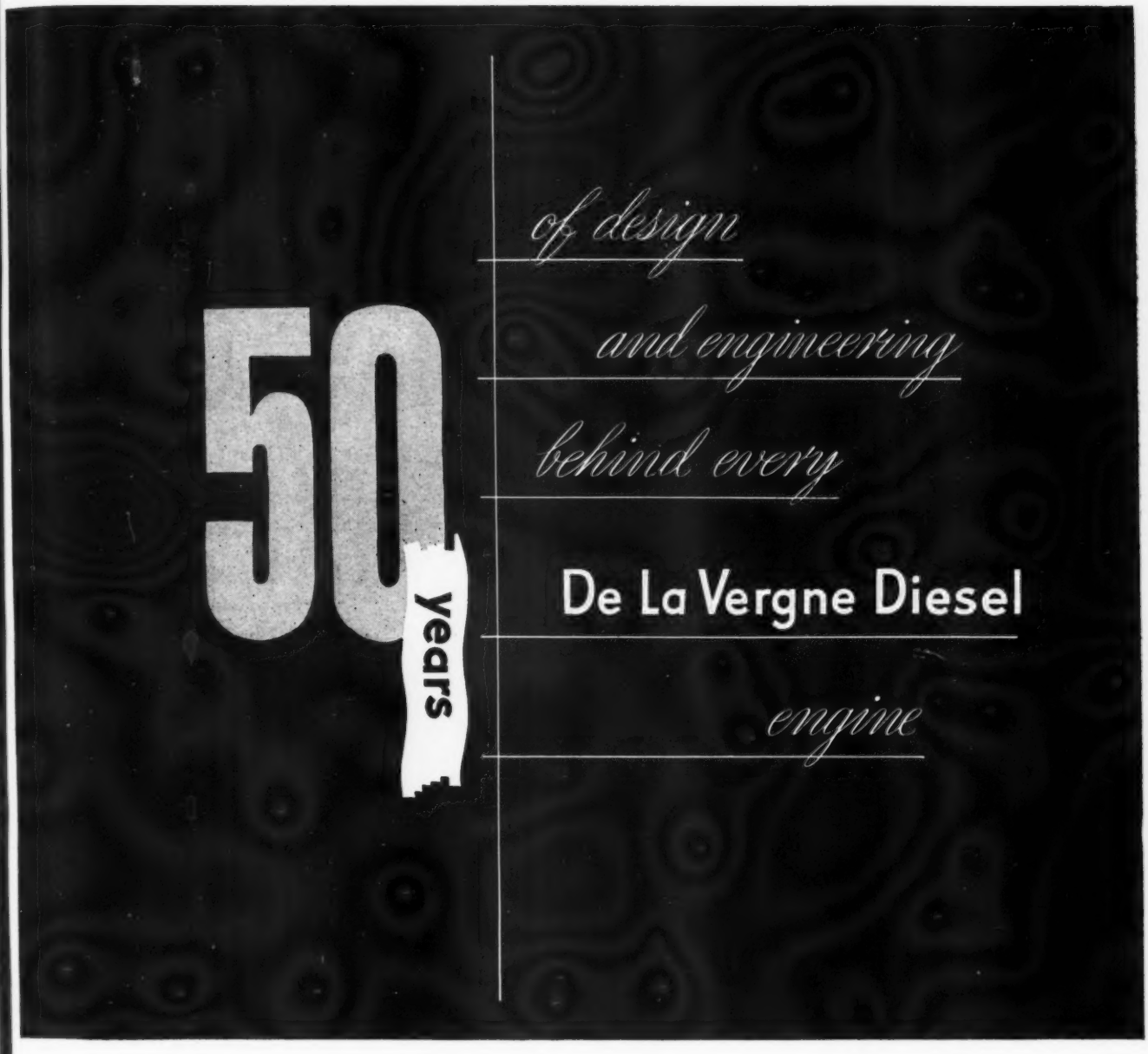
Solid wedge with cored or I-beam construction . . . double disc with parallel or taper sides . . . whatever may be your preference of discs for iron-body gate lines . . . are all available in the extensive line of Kennedy Valves.

And if you would like advice as to the most suitable type for your particular requirements, the Kennedy engineers are prepared to offer authoritative recommendations, based on their long experience in designing valves for every standard requirement.

The Kennedy line includes iron-body and bronze gate, globe, angle and check valves, cast iron flanged fittings and flanges, malleable iron and bronze screwed fittings, and many valve specialties . . . all described in the 240-page Kennedy catalog which will be sent on request.

**THE KENNEDY VALVE MFG. CO.**
**ELMIRA • NEW YORK**

**KENNEDY** *valves . . . pipe fittings . . . fire hydrants*




In 1893, De La Vergne built its first oil engine, which today is considered by many to be the forerunner of the modern diesel engine. Starting with the oil engine, every De La Vergne that has followed has been engineered and designed to meet the exacting requirements of the application.

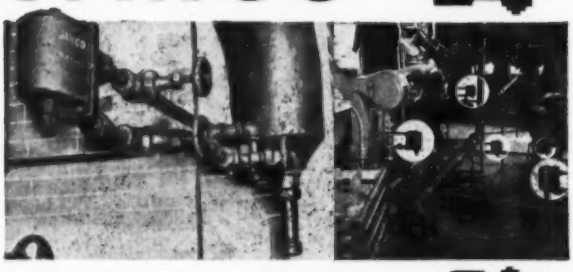
De La Vergne has built diesel engines for practically every type of application. Ranging from 200 bhp to 1,600 bhp, they have provided unfailing low cost power in ice plants, marine and diesel-electric locomotive installations, industrial plants, textile, cotton oil, and flour mills, public buildings, hotels, colleges and others.

The knowledge and experience gained in 50 years of oil engine manufacturing is built into every De La Vergne.

BALDWIN
De La Vergne
SALES CORP.

SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

# SARCO



Bears for Punishment

## BUCKET TRAPS

Demons for Speed

Only one of the 12 essential Sarco Products is illustrated on this page. It's the Bucket trap—a bear for punishment, and a demon for speed; it is the mainstay of heavy heat users, where large volumes of condensate are generated continuously. The inverted bucket operates a heavy but simple mechanism of great power. The valve is protected by a strainer inside the trap. This trap can be equipped with air by-pass for rapid elimination of air and gas. Standard types up to 250 lbs. Special forged steel types up to 900 lbs. Catalog No. 350.

151

**SARCO** SAVES STEAM

**SARCO COMPANY, INC.**
475 Fifth Avenue, New York, N. Y.
Sarco Canada Ltd., Federal Bldg., Toronto, Ont.

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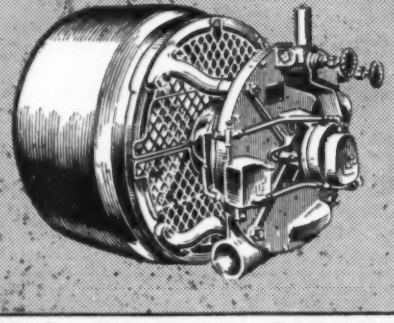
*Another* **WING** *Product*



## WING TURBINE BLOWERS

**The original in 1903 • • • The Standard since**

Suitable for brickwall mounting, serving stoker, oil or hand-fired furnaces. Used likewise for secondary air applications on pulverized coal installations. Available with flanged discharge rings for windbox or air preheater mounting (Type R). Capacities up to 40,000 cfm. at 8" static. These blowers are rugged, reliable, economical, and simple to operate. A mere turn of steam valve, manually or automatically, varies the speed and capacity. Especially quiet designs now available. Oil free exhaust steam permits absorption in feed water, process and heating system with great economy.

**L. J. WING MFG. CO.**

West 14th St. & 7 Ave., New York, N. Y. — Factories: Newark, N. J.

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# *Announcing*

**THE SCHAUB**

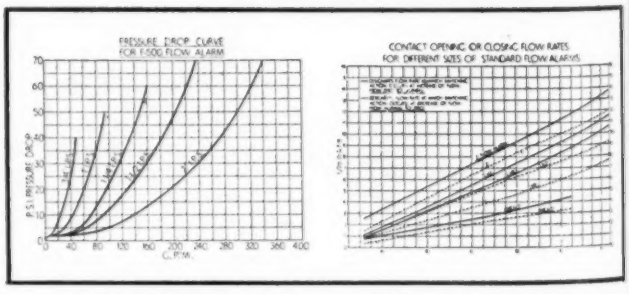
**MAGNETROL**
PATENTS PEND. TRADE MARK

# FLOW ALARM

**WRITE TODAY for Full Details on the Schaub MAGNETROL Flow Alarm, its applications, advantages, etc.**

Automatic and dependable check on the rate of flow of a liquid is provided by a Schaub MAGNETROL Flow Alarm installed in the line. Whenever the rate of flow starts, stops or goes above or drops below the desired point, this unit gives an instant warning—audible or visible, or both, by means of a bell or lamp located nearby or at a remote point.

The MAGNETROL Flow Alarm is carefully engineered and precision made for accurate and maintenance-free service. For example, switching action is brought about *without mechanical linkage between the moving parts inside the body of the valve and the switch.* Write us today for complete information.


PRESSURE DROP CURVE FOR F-500 FLOW ALARM
P.S.I. PRESSURE DROP
C.F.M.
CONTACT OPENING OR CLOSING FLOW RATES FOR DIFFERENT SIZES OF STANDARD FLOW ALARMS

### SPECIFICATIONS MODEL F-500 FLOW ALARM

**Maximum Operating Pressure:** 200 lbs. W.S.P., 400 lbs. W.O.G. **Switch:** Mercury-to-mercury switch, furnished with either S.P.S.T. or S.P.D.T. action. **Kind of Service:** Designed for cold liquids (water, oil, etc.) but is available to operate at higher temperatures. **Sizes:** ¾", 1", 1¼", 1½", 2". Can be used on larger line by installing in a bypass. **Other Features:** Operates solely on rate of flow (see chart), regardless of pressure. All parts made of finest quality materials.

**FRED H. SCHAUB ENGINEERING CO., INC.**
673 N. Orleans Street, Chicago, Illinois

# COTTRELL PROCESS

*of*

# ELECTRICAL PRECIPITATION

**universally recognized as a**
**standard method of removing**

**DUST, FLY ASH, FUME, MIST & FOG**

***from* GASES**

•

**30 years of research development and operating experience throughout the world is incorporated in the**

**COTTRELL INSTALLATIONS**

offered to meet the requirements
of any problem by

## RESEARCH CORPORATION

405 LEXINGTON AVENUE
NEW YORK CITY

59 EAST VAN BUREN STREET
CHICAGO, ILL.

If you work with steam, get this

# NEW *Strong* TRAP HANDBOOK!

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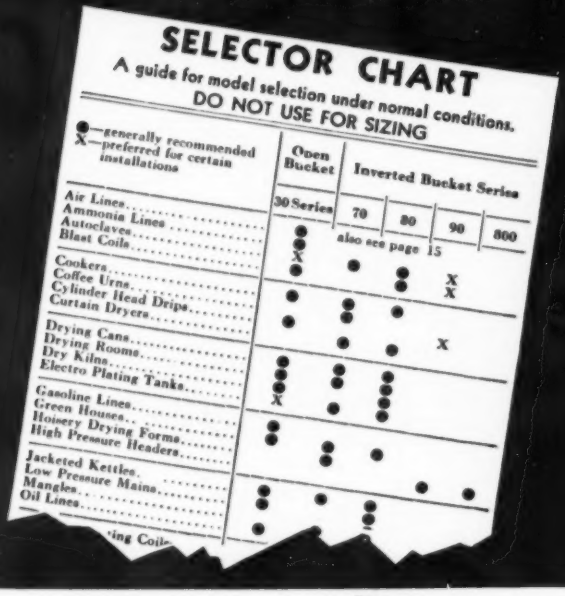

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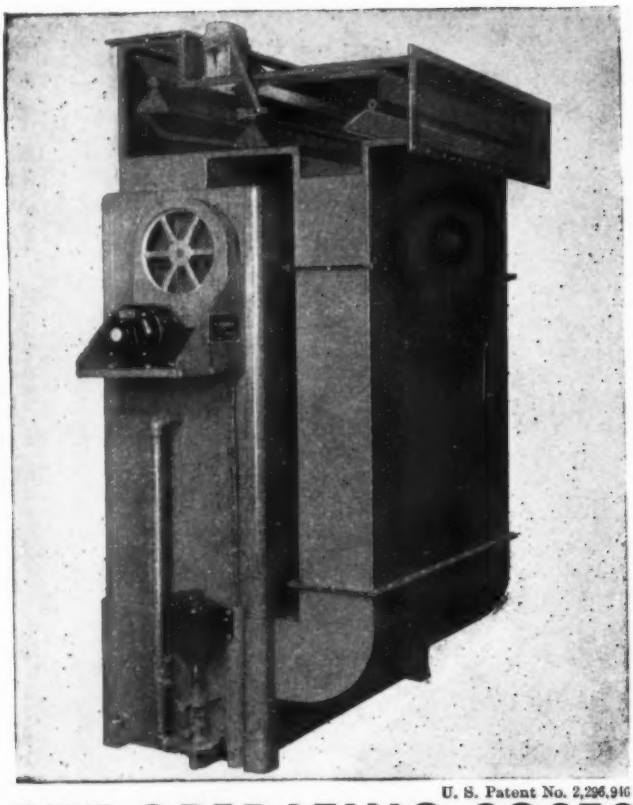

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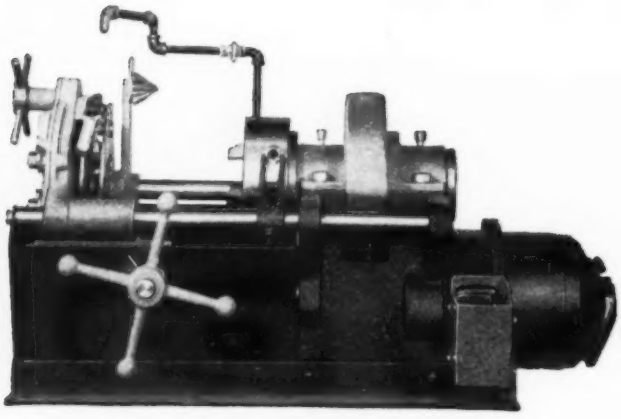

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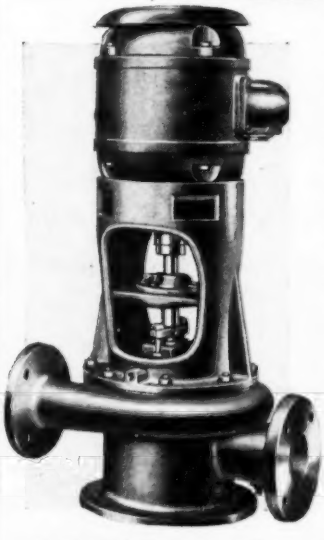

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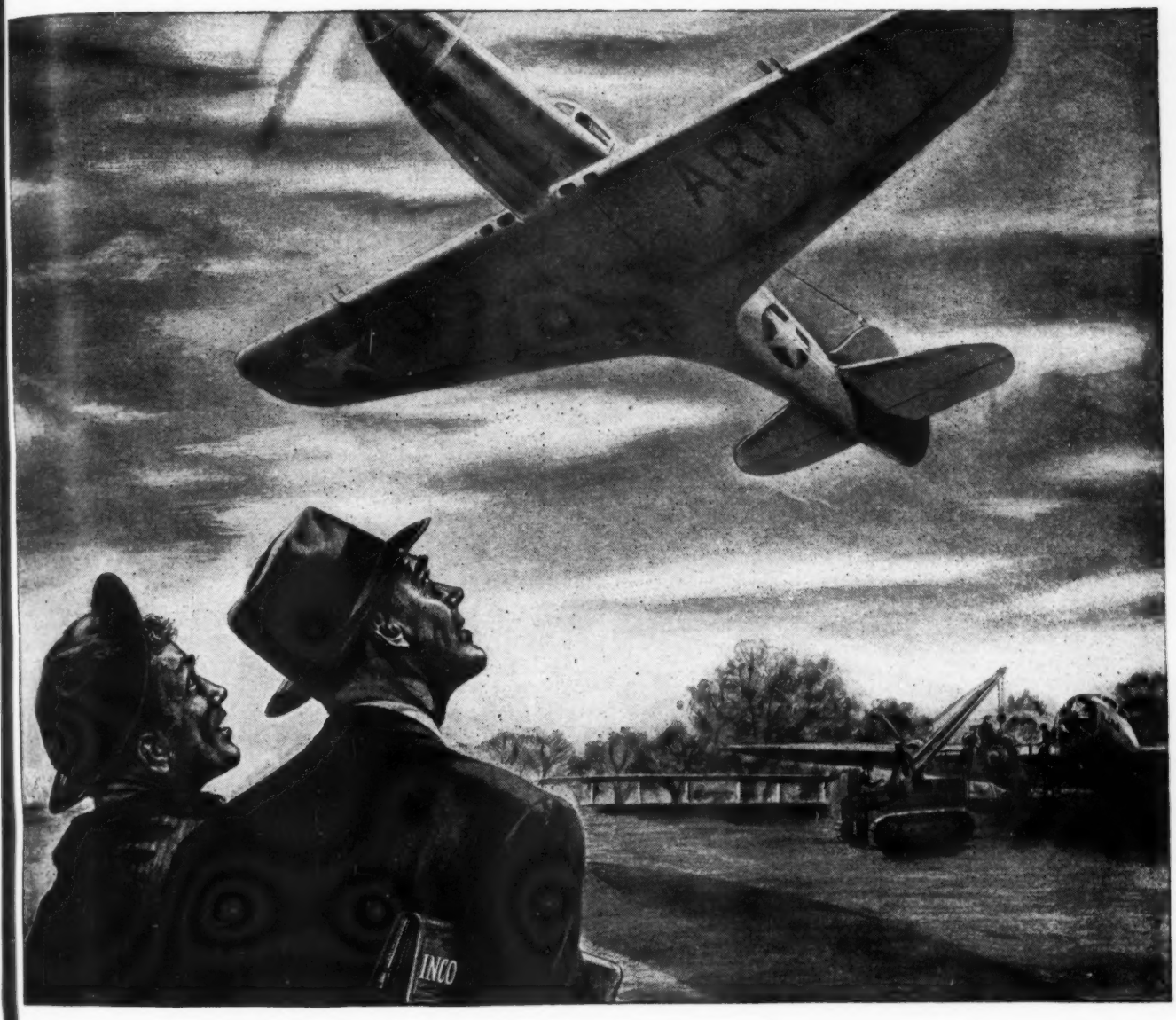


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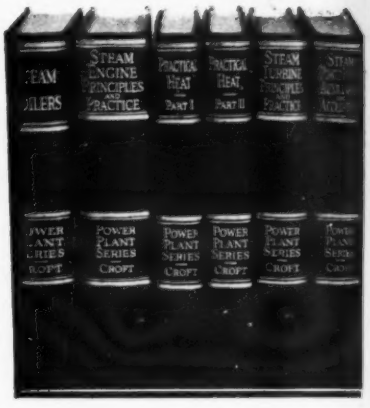
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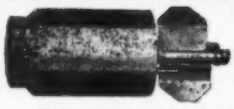

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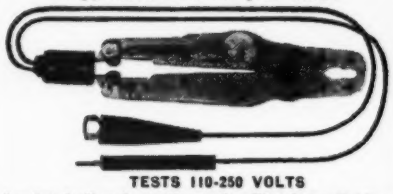

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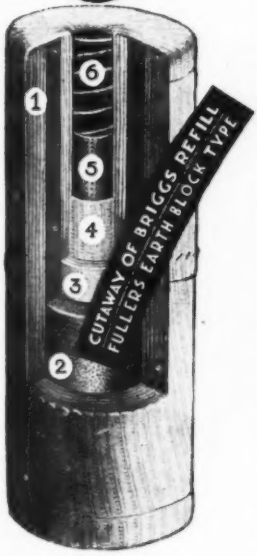


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2. Fullers Earth Block
3. Cellulose 4. Knit Tubing
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WHETHER OIL is maintained "refinery pure"—or merely cleaned of solid abrasives—depends on the filter's ability to go *a step beyond* removing carbon, dirt and grit. That *extra step*—which spells the difference between maintaining oil chemically pure as well as physically clean—is the ADsorption of invisible impurities; the absolute removal of harmful acids, resins and gums from the oil.

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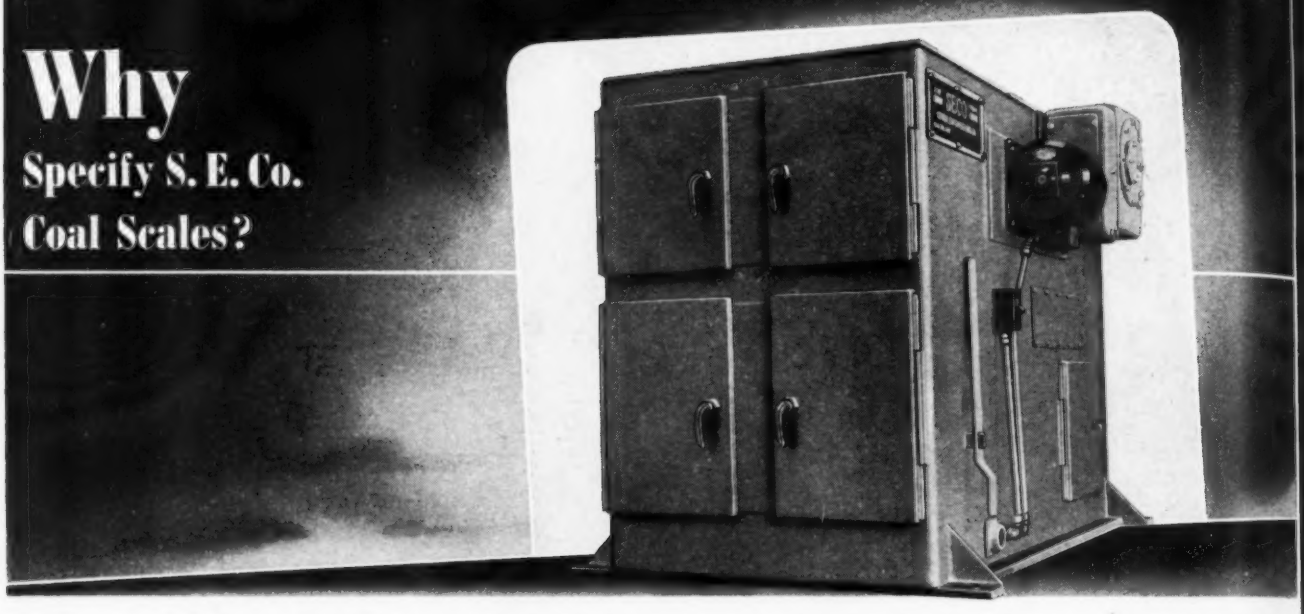

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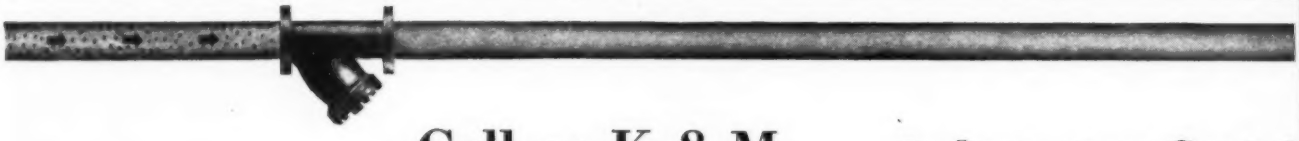

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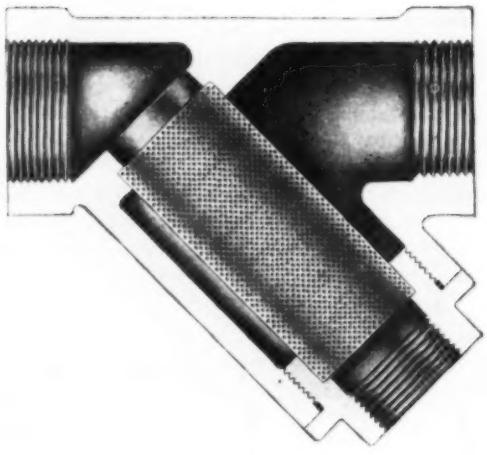

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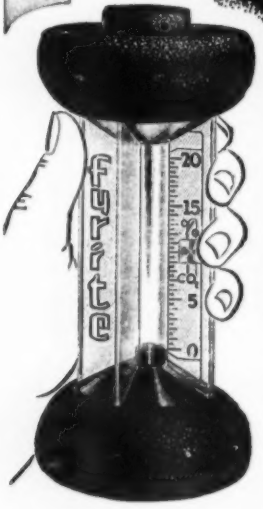

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But a great instrument task still remains . . . before victory is ours. So WESTON workers continue reaching for new goals . . . with the same determination, the same painstaking devotion to the quality ideal, responsible for WESTON'S *continuing leadership* in the instrument field. Weston Electrical Instrument Corporation, Newark, New Jersey.

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# SEARCHLIGHT SECTION

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FIRE PROTECTION ENGINEER and Inspector. Permanent positions open in New York, Pennsylvania, or the Middle West with large industrial fire insurance organization. Previous knowledge in this work not necessary. Applicant must be a technical graduate with manufacturing or engineering experience, and possess a good personality. Send photo with letter. Men subject to draft for military service cannot be considered. P-521, Power, 330 W. 42nd St., New York, N. Y.

WATCH ENGINEER Experienced, capable, sober and reliable man for steam turbine electric plant in a City of the South. High school graduate, or better, preferred. Drifters and seekers for high wartime pay rates need not apply. If you are looking for a normal position, at good rates, give names of references, age, family situation, draft classification, education and full outline of experience in first letter. References will not be contacted until your permission is given. P-522, Power, 520 N. Michigan Ave., Chicago, Ill.

PROGRESSIVE, well-known manufacturer of pumping equipment has an opening for an experienced sales or application engineer, preferably one whose experience covers centrifugal, rotary, and turbine type pumps. The position to be filled results from expansion which is part of a long-range program and is not a short-term or war-time proposition. All replies will be considered strictly confidential. P-524, Power, 520 N. Michigan Ave., Chicago, Ill.

GRADUATE MECHANICAL ENGINEER with about six years' practical operating and control experience in industrial power stations. Large eastern chemical plant. Growing concern. Salary open. P-531, Power, 330 W. 42nd St., New York, N. Y.

SHIFT OPERATOR WANTED—Permanent job in modern steam station of power company in small southern town. Experience necessary. Thorough technical training desired; some is essential. Basic minimum of high school education. Not temporary job in war plant. Permanent opening for sober, reliable and capable man. In replying outline experience, education and reference. Give family and draft status, age, physical condition. Good but not war-inflated salary. References confidential until released. P-532, Power, 520 N. Michigan Ave., Chicago, Ill.

POWER PLANT MAINTENANCE MACHINIST, experienced in maintenance of turbines and water tube boilers. High pressure steam plant experience desirable. Permanent position on work which is both war and essential civilian production. Location near New York City. Write giving full particulars, education and experience. P-533, Power, 330 W. 42nd St., New York, N. Y.

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forget the
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### OPERATING ENGINEERS—WANTED

**Operating engineers who have or have had a Marine Engineers' License. Wages from $300 to $700 per month.**

*Apply*

**Local No. 33, M. E. B. A.**
**227 Fulton Street — New York City**

### POSITIONS VACANT

LARGE INDUSTRIAL COMPANY operating own power plant in Waterbury, Connecticut, is seeking night power plant supervisor. Must be United States citizen, preferably between 35 and 40 years of age, with suitable experience in public utility, or large industrial plant, or turbo generators, steam and air units. State salary expected. P-534, Power, 330 W. 42nd St., New York, N. Y.

ENGINEER for Tube Fabricating plant. Permanent position. Technical graduate with experience preferred, to take full charge of Engineering, Design and Production. Excellent opportunity with small, expanding organization. State complete personal details: Age, experience, marital status, salary expected. Replies strictly confidential. P-535, Power, 330 W. 42nd St., New York, N. Y.

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SALARIED POSITIONS—This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc. 270 Delward Bldg., Buffalo, N. Y.

### POSITION WANTED

POSITION WANTED—20 years experience as operating and chief engineer in Textile and Paper Mills. Past 45 years of age. Married. PW-536, Power, 330 W. 42nd St., New York, N. Y.

### BUSINESS OPPORTUNITY

MANUFACTURING RIGHTS WANTED—Independent manufacturer with complete engineering and research staff, production facilities, and international industrial sales organization wishes to develop new markets and products, particularly steam plant or allied process apparatus and in instrument and control fields. Write brief letter. BO-539, Power, 330 W. 42nd St., New York, N. Y.

### FOR SALE

BOILERS—2 high pressure 150 h.p., with piping, valves, fittings, pumps, etc. Good condition. Location central Iowa. Priced to sell. Address FS-537 Power, 520 N. Michigan Ave., Chicago, Ill.

FOR SALE 2—Fairbanks-Morse, AC, model 36A, Diesel Electric Generating Sets, direct driven. In perfect condition. Now in operation. Inspection by appointment only. Telephone University 4-4250 or write Black & White Corp., 574 West 130th St., New York, N. Y.

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**Oklahoma City — Oklahoma**

**FOR SALE**
**Additional For Sale Ads on Pages 316-335**

**FOR SALE**

**GAS ENGINES**

Three (3)—120 H.P. Chicago Pneumatic RHG-40-B vertical 3 cylinder gas engines complete. Now on original foundations near Lake Charles, Louisiana. Must move immediately. Very good condition. Will sell to highest bidder subject inspection and acceptance.

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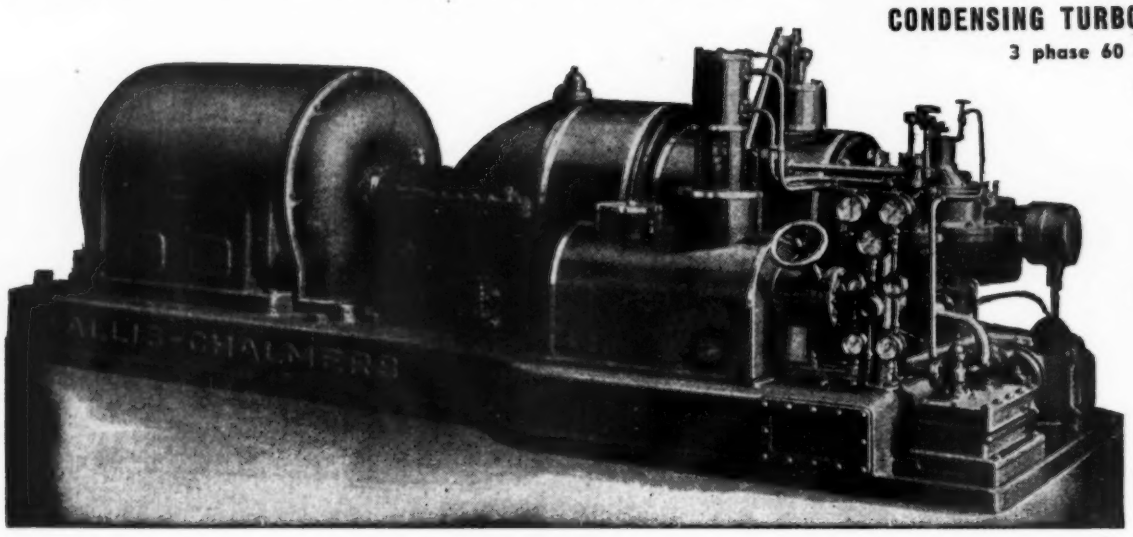
**ERIE, PENNA.**

## SEARCHLIGHT SECTION

# ELECTRICAL POWER EQUIPMENT

### CONDENSING TURBO GENERATORS

**3 phase 60 cycle**




*Actual Photograph*

**1250 KVA ALLIS CHALMERS CONDENSING TURBO UNIT**

*1250 KVA Allis Chalmers alternating current generator 3 phase 60 cycle 2300 volts 3600 RPM direct connected to Allis Chalmers condensing turbine 150-200 lbs. steam pressure 100 deg. superheat. Equipped with jet condenser and auxiliaries.*

3125 KVA GENERAL ELECTRIC 225/400 lbs. 700 deg. T.T., 2400 / 4160 volts with surface condenser

1875 KVA GENERAL ELECTRIC 160 lbs. 500 deg. T.T., 2300 volts with surface condenser

1250 KVA ALLIS CHALMERS 150/200 lbs. 500 deg. T.T., 2300 volts with jet condenser

625 KVA (2) GENERAL ELECTRIC 150/175 lbs. 500 deg. T.T., 2300 volts, with jet condenser

### SURFACE CONDENSER

1540 sq. ft. WORTHINGTON surface condenser with steam jet air pumps

### ENGINE GENERATOR UNITS (STEAM)

**3 phase 60 cycle**

438 KVA GENERAL ELECTRIC-SKINNER uniflow, 150 lbs., 5 lbs. back pressure, 240/480/2300 volts

500 KVA ALLIS CHALMERS corliss, 175 lbs., 25 lbs. back pressure 240/480 volts

675 KVA GENERAL ELECTRIC-AMES uniflow, 160 lbs., 7 lbs. back pressure, 240/480 volts

### ENGINE GENERATOR UNITS (DIESEL)

**3 phase 60 cycle**

57.7 KVA FAIRBANKS-MORSE single-cylinder full Diesel, 240 volts 300 RPM

121 KVA FAIRBANKS-MORSE 2-cylinder full Diesel, 240 volts 300 RPM

250 KVA (4) CROCKER WHEELER-WORTHINGTON 6 cylinder full Diesel, 208/120 volts 400 RPM

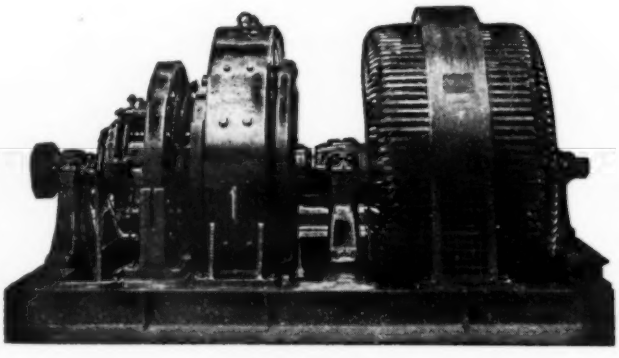
### ROTARY CONVERTERS

**3 phase 60 cycle**

3500 KW (2) WESTINGHOUSE 225-285 volts D. C., 225 RPM, with 13200 volt transformers

1500 KW WESTINGHOUSE 225-285 volts D. C. 450 RPM, with 2300/4000-6900/12000 volt transformers

750 KW GENERAL ELECTRIC 600 volts D. C., 1200 RPM, with 2300/4000 volt transformers



*Actual Photograph*

**1000 KW GENERAL ELECTRIC MOTOR GENERATOR SET**

*1000 KW (1250 KW 2 hrs. 55 deg. C rises) GENERAL ELECTRIC direct current generator 125/250 volts 3-wire 720 RPM direct connected to 1400 HP 80% P.F. (1750 HP 2 hours 55 deg. C rise) GENERAL ELECTRIC synchronous motor 3 phase 60 cycle 13200/6600 volts 720 RPM. Equipped with D.C. breakers.*

### MOTOR GENERATOR SETS

**3 phase 60 cycle**

1000 KW GENERAL ELECTRIC synchronous 125/250 volts 3-wire D. C., 13200/6600 volts A. C., 720 RPM

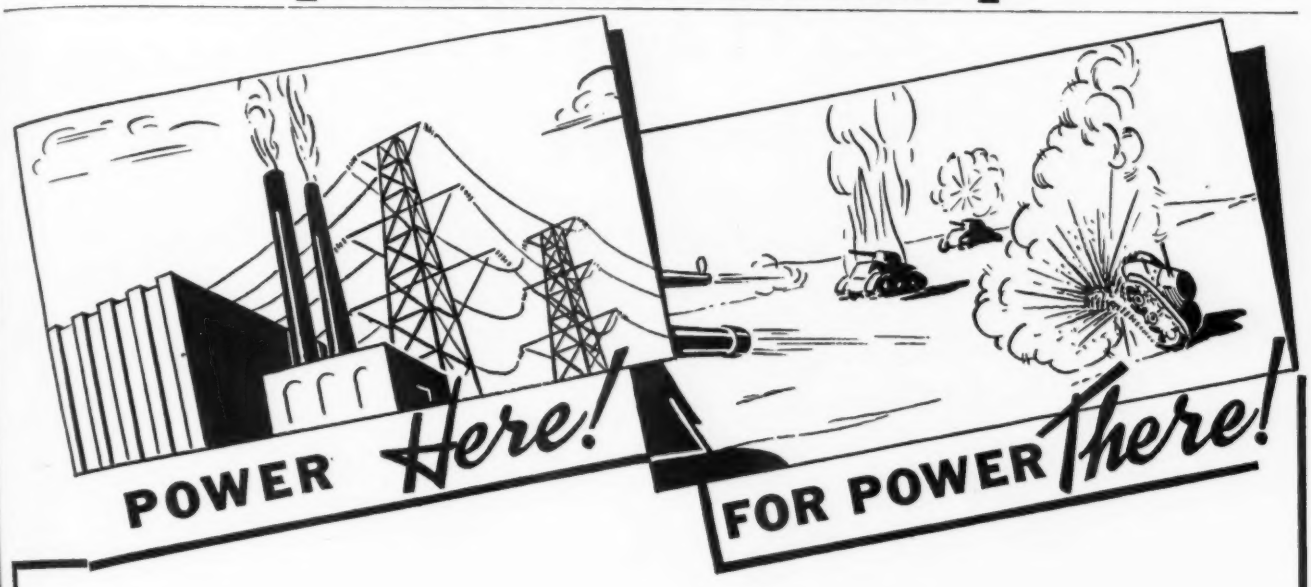
1000 KW GENERAL ELECTRIC 3-UNIT synchronous 125/250 volts D. C., 4000/2300 volts A. C., 720 RPM

500 KW GENERAL ELECTRIC synchronous 700 volts D. C., 4150 volts A. C. 720 RPM

## THE NATIONAL POWER MACHINERY CO.

**1921 SCRANTON ROAD** — **CLEVELAND, OHIO**

# SEARCHLIGHT SECTION




### MOTORS GENERATOR SETS

1—35 KW, 125 volt, Electric Machinery squirrel cage induction motor.
1—20 KW, 600 volt, General Electric squirrel cage induction motor.

### ALTERNATORS

1—625 KVA, 3600 RPM, 600 volt, G.E.
1—250 KVA, 720 RPM, 230 volt, G.E.
1—200 KVA, 3600 RPM, 240 volt, Allis Chal.
1—62½ KVA, 3600 RPM, 220 volts, Allis Chal.

### MOTORS—3 PHASE 60 CYCLE

1—720 HP, 360 RPM, 440 volt, G.E., syn.
1—400 HP, 514 RPM, 440 volt, Westg., slip ring.
1—335 HP, 600 RPM, 2300 volt, G.E., syn.
1—300 HP, 720 RPM, 2200 volt, G.E., slip ring.
1—250 HP, 514 RPM, 4000 volt, G.E., syn.
1—250 HP, 600 RPM, 4000 volt, G.E., Sync.
1—200 HP, 600 RPM, 2200 volt, G.E., sl. rg.
1—200 HP, 450 RPM, 2200/4000 v., G.E., sl. rg.
1—150 HP, 1800 RPM, 2300 volt, Al. Ch. sq. cg.
1—150 HP, 900 RPM, 440 volt, Al. Ch. sl. rg.
1—150 HP, 720 RPM, 440 volt, G.E., sl. rg.
1—150 HP, 600 RPM, 440 volt, G.E., sl. rg.
1—150 HP, 400 RPM, 440 volt, G.E., sq. cg.
2—125 HP, 720 RPM, 440 volt, G.E., sl. rg.
1—100 HP, 900 RPM, 440, Westg., sq. cg.
1—100 HP, 900 RPM, 440 volt, G.E., sl. rg.
3—100 HP, 720 RPM, 440 volt, G.E., sl. rg.
1—100 HP, 720 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 600 RPM, 440 volt, G.E., sl. rg.
1—100 HP, 600 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 514 RPM, 440 volt, G.E., sq. cg.

### INSTRUMENTS

**25—Westinghouse type U Recording Ammeters with slit core, CT.**
**25—Westinghouse type U Recording Voltmeters.**

### MOTORS—3 PHASE 60 CYCLE (Con't)

2—100 HP, 450 RPM, 440 volt, G.E., sq. cg.
1—90 HP, 400 RPM, 550 volt, Cr. Whlr., sq. cg.
1—75 HP, 900 RPM, 4000 volt, Elec. Mach. syn.
1—75 HP, 900 RPM, 220 volt, Fairbanks Morse, slip ring.
1—75 HP, 900 RPM, 440 volt, G.E., sq. cg.
1—75 HP, 720 RPM, 440 volt, Westghse., slip ring.
1—75 HP, 720 RPM, 440 volt, G.E., sq. cg.
2—75 HP, 1200 RPM, 2200 volt, G.E., Vertical.
1—50 HP, 900 RPM, 440 volt, G.E., sl. rg.
1—50 HP, 900 RPM, 440 volt, G.E., sq. cg.

### MOTORS—D.C. 230 VOLTS

2—450 HP, G.E., 400 RPM, Type MPL, Form 1-F.
1—250 HP, 760 RPM, Electro Dynamic.
2—150 HP, Westghse., 550 RPM, Type SK.
1—150 HP, 750 RPM, Electro Dynamic.
1—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, G.E., 575 RPM.
1—100 HP, 625 RPM, G.E.
1—80 HP, Crocker-Wheeler, 600 RPM, Type CMC.
1—75 HP, G.E., 575 RPM, Type C, Sprague; with spare armature.
1—65 HP, 1000 RPM, G.E., Type RC.
8—50 HP, Crocker-Wheeler, 700 RPM, Type CM.
1—65 HP, G.E., 625 RPM, Type DLC-65, Form A.
1—50 HP, 750 RPM, Westghse., Type SK.
1—50 HP, 700 RPM, Crocker-Wheeler.
1—40 HP, G.E.-Sprague, 700 RPM, Type LC.
1—40 HP, 775 RPM, Westinghouse.
1—40 HP, 300 RPM, G.E.
1—30 HP, 750 RPM, G.E., type RC.
1—30 HP, G.E., 750 RPM, Type RC-14, Form A.
1—30 HP, G.E., 1100 RPM, Type RC-31B, Form A-21.
1—35 HP, G.E., 650 RPM, Type RC-15.
1—30 HP, G.E., 625 RPM, Type C.
1—25 HP, Westghse., 600 RPM, Type SK.
2—25 HP, G.E., 775 RPM, Type RC-13.
1—20 HP, G.E., 800 RPM, Type RC-12, Form A.
2—20 HP, Westghse., 1700 RPM, Type SK.
1—15 HP, G.E., 800 RPM, Type RC-11.

### TRANSFORMERS

2—400 KVA, G.E., 4156-240/480 v., Scott taps.
3—300 KVA, Pittsburgh, 7800/440 volts.
3—150 KVA, G.E., 33,000 2300/4000 Y.
1—150 KVA, G.E., 2400-120/240 volts.
3—100 KVA, Westinghouse, 11,430/250 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
1—100 KVA, G.E., 2200-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
3—75 KVA, G.E., 13,500-750/440 volts.
1—75 KVA, G.E., 3 phase, 4156Y—120/208Y.
3—50 KVA, Wagner, 4150-220 volts.
2—50 KVA, Pbgh. 7500/15,000 volts-110/220 volts.
4—37½ KVA, 2200-220/110 v.
7—25 KVA, Westg., air cooled, 440/220-110 volts.
1—25 KVA, G.E., 220/110-220/110 volts.
2—15 KVA, G.E., 2300-115/230 volts.

### MOTORS—VARIABLE SPEED 230 VOLTS

2—100 HP, 475/1375 RPM, Electro Dynamic.
1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electro Dynamic.
1—60 HP, 600/1200 RPM, General Electric.
1—35 HP, 500/1500 RPM, Westinghouse.
1—35 HP, 350/1050 RPM, Electro Dynamic.
1—30 HP, 225/900 RPM, Crocker Wheeler.
7—25 HP, Westinghouse, 650/2200 RPM, Type SK-110L.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—15 HP, 300/1200 RPM, G.E.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1—5 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker Wheeler.
1—5 HP, 400/1600 RPM, Diehl.
1—5 HP, 225/900 RPM, Electro Dynamic.

### TURBO-GENERATORS

600 KW Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder.
1—375 KVA, Westghse., non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 v., cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 v., cond.

Hemphill FOR POWER

J. L. HEMPHILL & COMPANY

1602 53rd ST., NORTH BERGEN, N. J.

PHONE NEW YORK—LONGACRE 5-3227 NEW JERSEY—UNION 3-2600

# BELYEA OFFERS

# STOCK EQUIPMENT

## *shipment as fast as conditions allow*

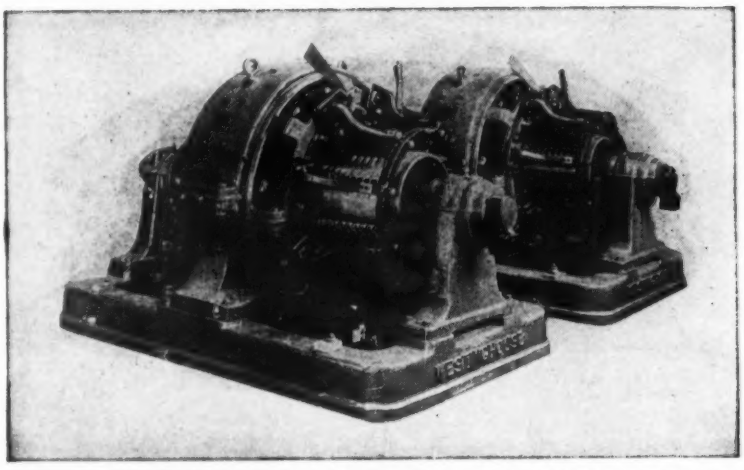


Photo above shows 2- 1000 KW, 600 volt, 60 cycle rotary converters which have been completely renovated. Once used for railway service, these units now help build ships.

### ROTARY CONVERTERS

**Primary 3 Phase 60 Cycle**

1—1500 KW WHSE., 720 R.P.M., D.C. 600 V. A.C. 26400/13200 V.
1—1500 KW WHSE., 600 R.P.M., D.C. 600 V., A.C. 11500/10360 V.
1—1250 KW G.E., HCC, 720 R.P.M. D.C. 250 V., A.C. 2300 V.
1—1000 KW WHSE., 900 R.P.M., D.C. 600 V. A.C. 11000/23000 V.
2—750 KW WHSE., 1200 R.P.M., D.C. 600 V. A.C. 5500/2300 V.
1—750 KW WHSE., 720 R.P.M., D.C. 250 V., A.C. 6600/2300 V.
1—500 KW WHSE., 900 R.P.M., D.C. 250 V., A.C. 6600/2300 V.
1—500 KW WHSE., 1200 R.P.M., D.C. 600 V., A.C. 2300 V.
3—375 KW WHSE., 1200 R.P.M., D.C. 250 V., A.C. 6600/2300 V.
3—300 KW G.E., HCC, 1200 R.P.M., D.C. 600 V., A.C. 2300 V.

### ROTARY CONVERTERS

**3 Phase, 25 Cycle Booster Type**

2—1500 KW G.E., HCC, 500 RPM., D.C. 225/275 V., 6000 Amp. A.C. 13200/6600 V.
1—500 KW G.E., HCC, 750 R.P.M., D.C. 225/275 V., 2000 Amp. A.C. 6600 V

### MOTOR GENERATOR SETS

**3 Phase 60 Cycle**

1—1500 KW G.E., 600 V. D.C. to 2100 H.P. 6600 V.
1—500 KW, 3 unit consisting of 2—250 KW, G.E., 250 V., d.c., to 1—700 HP, 2300 V.
1—500 KW G.E., 600 V. D.C. to 700 H.P. 13200/6600 V.
1—500 KW G.E., 600 V. D.C. to 700 H.P. 2200 V.
1—400 KW, G.E., 250/275 V., d.c. to 600 HP, 2300 V.
2—250 KW G.E., 250 V. D.C. to 375 H.P. 2200 V.
1—150 KW G.E., 250 V. D.C. to 200 KVA, 440 V.
1—150 KW G.E., 575 V. D.C. to 225 H.P. 2300/4000 V.
1—125 KW WHSE., 250 V. D.C. to 200 H.P. sq. cg., 440 V.
1—100 KW WHSE., 250 V. D.C. to 150 KVA, 2300 V.
1—100 KW WHSE., 250 V. D.C. to 175 H.P. sl. rg. 2200 V.
1—75 KW G.E., 125 V. D.C. to 120 H.P., sq. cg., 2300/4000 V.
2—50 KW G.E., CD, 125 V. D.C. to 75 H.P., sq. cg., 2300/4000 V.
1—40 KW WHSE., 230 V. D.C. to 45 KVA 2300 V.

### TURBO GENERATOR SETS

1800 KW Whse. 625 Kva, 440 V. 3 ph. 60 cy. 3600 RPM with Parsons 145/175 lb. cond. turbine complete with jet cond. and access.

1—500 KW G.E. 625 Kva 2300 V. 3 ph. 60 cy. with Curtis 4-stage 150 lb. cond. turbine with cond. and access.

1—75 KW Ridgeway 250 V. D.C. with Terry turbine 180 lb. pressure with 12 lb. bk. pres., 2000 RPM.

### GEAR REDUCTION UNITS

1—2100 H.P. Whse. 1800/360 RPM
1— 943 H.P. G.E. 5306/1200 RPM.
1— 750 H.P. Al. Ch. 3600/600 RPM
1— 450 H.P. G.E. 5600/1200 RPM.

### A. C. MOTORS

**3 Phase—60 Cycle**

**SLIP RING**

| HP | Make | Type | Volts | Speed |
|---|---|---|---|---|
| 2—1200 | Cr. Wh. | 801Q | 2300 | 237 |
| 1— 800 | Al. Ch. | ANY | 440 | 885 |
| 1— 600 | G.E. | IM | 2200 | 900 |
| 1— 450 | Whse. | HW | 2200 | 875 |
| 1— 400 | Al. Ch. | ANY | 440 | 1200 |
| 1— 400 | G.E. | MT | 550/440 | 300 |
| 1— 400 | Al. Ch. | ANY | 2300 | 505 |
| 1— 350 | G.E. | MT-442 | 2300/4000 | 257 |
| 1— 300 | G.E. | IM | 440 | 720 |
| 1— 250 | G.E. | MT | 4000/2300 | 257 |
| 1— 250 | G.E. | MT-410 | 2300 | 390 |
| 2— 200 | G.E. | IE-M | 2200 | 1750 |
| 2— 200 | Whse. | CW | 2200 | 514 |
| 1— 200 | G.E. | I-M | 440 | 600 |
| 2— 175 | G.E. | IE-M | 2200 | 880 |
| 1— 150 | G.E. | IM | 2200 | 695 |
| 1— 150 | Whse. | CW | 220 | 1165 |

### A. C. MOTORS

**SQUIRREL GAGE**

| HP | Make | Type | Volts | Speed |
|---|---|---|---|---|
| 1—500 | G.E. | I-17B | 2200 | 690 |
| 1—400 | Whse. | CS-1104A | 2200 | 585 |
| 1—300 | Whse. | CS | 550 | 580 |
| 1—300 | G.E. | IK | 440/2300 | 600 |
| 1—250 | Al. Ch. | | 220/440 | 1150 |
| 2—200 | Whse. | CS | 2300 | 1200 |
| 1—200 | G.E. | IK | 2200 | 490 |
| 1—200 | Whse. | CS | 4600 | 900 |
| —150 | Al. Ch. | AN | 440 | 1765 |
| 1—100 | Whse. | CS | 550 | 1750 |

### A. C. GENERATORS AND SYNC. MOTORS

**3 Phase—60 Cycle**

| KVA | Make | Type | Volts | Speed |
|---|---|---|---|---|
| 1—625 | Whse. | | 480 | 900 |
| 1—500 | G.E. | TS | 440 | 360 |
| 1—250 | G.E. | ATB | 2300 | 600 |
| 1—250 | G.E. | ATI | 220 | 450 |
| 1—225 | G.E. | ATB | 220 | 600 |
| 1—150 | Whse. | | 2400 | 900 |
| 1—150 | Whse. | | 4000 | 1800 |
| 1—100 | Whse. | | 2400 | 900 |
| 2—100 | Whse. | | 2300 | 1800 |
| 1— 45 | Whse. | | 2300 | 514 |

### TRANSFORMERS

**60 Cycle**

| KVA | Make | Ph. | Type | Voltage |
|---|---|---|---|---|
| 3—1000 | G.E. | 1 | HKDD | 13200x2300 |
| 3—1000 | Pitts. | 1 | OISC | 2300/4600x575 |
| 4— 525 | G.E. | 1 | HJ-DD | 2300x445 |
| 3— 400 | Whse. | 1 | S | 2400x440 |
| 2— 333 | Whse. | 1 | OISC | 2300x460 |
| 2— 333 | Pitts | 1 | OISC | 2400x220 |
| 3— 300 | Pitts. | 1 | OISC | 2300x115/230 |
| 3— 300 | G.E. | 1 | H | 13200x2300/575 |
| 2— 200 | G.E. | 1 | HILD | 26400x115/460 |
| 3— 200 | G.E. | 1 | H-KDD | 13800x230/440 |
| 3— 150 | Whse. | 1 | SK | 2200x440/220 |
| 3— 150 | Whse. | 1 | SKM | 2400x120/240 |
| 6— 100 | Whse. | 1 | SK | 6900x460/230 |
| 3— 100 | Whse. | 1 | OISC | 13200x250 |
| 3— 100 | G.E. | 1 | HK | 2200x440 |

### D. C. MOTORS

| HP | Make | Type | Volts | Speed |
|---|---|---|---|---|
| 1—2000 | Whse. | Mill | 600 | 300/500 |
| 1—1500 | Whse. | | 550 | 330 |
| 2—1250 | G.E. | MPC | 500 | 130 |
| 1— 800 | G.E. | MPC | 550 | 600 |
| 2— 625 | G.E. | MPC | 250 | 130 |
| 2— 600 | G.E. | MPC | 550 | 600/800 |
| 1— 600 | Whse. | | 230 | 150/275 |
| 1— 350 | G.E. | MPC | 230 | 450 |
| 1— 300 | G.E. | MCF | 230 | 400/1000 |
| 6— 300 | G.E. | DMC | 230 | 400/800 |
| 1— 300 | Cr. Wh. | CMC 102H | 230 | 1150 |
| 2— 300 | Whse. | | 500 | 250/400 |
| 1— 300 | G.E. | MPC | 230 | 275/550 |
| 1— 300 | G.E. | MPC | 230 | 250/440 |
| 2— 200 | Whse. | | 230 | 400/500 |
| 1— 175 | Whse. | SK | 250 | 150/525 |
| 7— 150 | G.E. | RC-19 | 230 | 800/1000 |
| 2— 150 | Whse. | SK | 230 | 300/900 |
| 2— 125 | G.E. | CO-1832 | 230 | 625 |
| 2— 120 | Whse. | SK | 230 | 720 |
| 1— 100 | Al. Ch. | | 230 | 950/1150 |
| 3— 100 | G.E. | LC | 230 | 1200 |
| 1— 100 | G.E. | MPC | 230 | 225/450 |
| 1— 100 | Whse. | SK | 230 | 600 |
| 2— 100 | G.E. | RC-19 | 230 | 575-720 |
| 1— 75 | G.E. | C | 230 | 500/1000 |
| 4— 60 | Diehl | K-11 | 230 | 500/1000 |
| 3— 60 | Cr. Wh. | CMC-65H | 230 | 500/1000 |
| 4— 50 | G.E. | RC-16 | 230 | 650/815 |
| 1— 50 | Cr. Wh. | CMC-81H | 230 | 300/900 |
| 1— 50 | Cr. Wh. | CMC-80H | 230 | 380/750 |
| 1— 50 | G.E. | RC | 230 | 400/1200 |

RENU-BILT BELYEA MOTORS

**SUCCESSFUL OPERATION GUARANTEED**

# BELYEA COMPANY INC.

**Main Office & Shop: 43 HOWELL ST., JERSEY CITY, N. J.**

## *Immediate Shipment for Quick Victory and Total Peace*

## *under Highest War Production Board Allocation only*

### TURBOS—60 cycles

15000 KW capacity condensing, non-automatic bleeder (approved 275# 550° t.t.) volume extraction at either 100 or 65# g.b.p. Elspecs 60/3/standard voltages. Complete going unit including surface condenser, all auxiliaries and piping.

•

3—5000 KW 80% nominal, 7200 KVA range, 225# I.S.P. Elspecs 60/3/2300/3600. High percentage original full strength, otherwise necessary blading in stock.

•

3—2000 KW 80% nominal, 2500 KW approved range 60/3/1440, 2-2300, condensing design and approved for non-condensing.

•

Several 300, 500, 750, 1000, 1200 and 1500 KW condensing standard pressure, also mixed pressure design.

•

### TURBOS—25 cycles

30,000 KW total aggregate capacity, unit sizes of 3000, 6000 to 20,000 KW surface condenser equipped complete going units. High percentage full strength.

### SURFACE CONDENSERS

8250, 11000, 12000, 15000 and 20000 sq. ft. surface condenser units complete. Log service on pure clear water. Condition sound.

### WATER TUBE BOILERS

2—350# ASME 80,000/120,000# t.s.g. cross drum units, underfeed stoker equipped.

### WATER TUBE BOILERS (Con't)

2—350# ASME 80,000/120,000# t.s.g. bent tube design, powdered fuel fired; one complete with boiler house stack, all auxiliaries, completely rebuilt and never operated.

•

4—700 HP 160,000# t.s.g. straight tube box steel header 200# ASME, without firing equipment.

•

8—400 HP 200# ASME bent tube design, superheaters, soot blowers, fans, heaters, coal and ash handling paraphernalia, etc. Also complete steel building.

•

12—200/500 HP straight and bent tube 200# units.

### STOKERS

111 Taylor underfeed ram type stokers now operating in 11 retort per boiler layout under 700,000# t.s.g. units. Clinker grinders, fans and other auxiliaries available. All now under dismantling schedule.

•

1—120,000# t.s.g. powdered fuel pulverizer, burners, fans, ducts, etc. Brand new.

### LARGE POWER TRANSFORMERS

50,000 KVA O.I.W.C. transformers, 150000/135000 delta—41,600/36,400; or 72,000/63,000 star.

•

9000 KVA transformers, as above.

•

15000 KVA O.I.W.C. 60,000/54,000—18,000/9000.

•

12000 KVA O.I.W.C. transformers, 16,000 through 12,000, 500 and 250 KVA unit sizes, 75,000/43,000—2300 and other standard voltage ratios.

***Complete data available on request.***

## "SQUARE COOPERATION IN HEAVY POWER THRU THREE WARS"

*"This is the record—so what?" . . . P.S.*

# KIEMLE OF TOLEDO, OHIO

MOTORS
GENERATORS
CONTROLS
TRANSFORMERS
MOTOR GENERATOR SETS
ETC.

# BERGER OF ROCHESTER, N.Y.

**Put all idle equipment to work. Send your list for prompt action.**

## TRANSFORMERS

4—500 KVA Gen. Elec. Type H form KDD, 60 cy. Single Phase, Primary 6900 V or 11950 Y; secondary 2300V—with taps.
3—500 KVA, GE, type H, form VD525 19100-22000/40000Y to 2300, 1 phase 25 cycle.
6—150 KVA Gen. Elec. type H 22000/220/440 25 cy. single phase.
1—200 KVA Allis Chal. 60 cy. 3 ph., 220/440.
1—300 KVA Gen. Elec. 60 cy. 3 ph., 220/440.

## ALTERNATORS

240 KW, 8 PF Electric Machinery, 4600 volts, 60 cycle 3 phase, 450 rpm with direct connected exciter.
200 KVA Gen. Elec. Ft. Wayne 3 ph., 60, 220/440, 720 RPM, revolving field.
150 KVA Gen. Elec. Type ATB form D, 60, 3 ph., 220/440 600 RPM, revolving field, built-in exciter.

## D. C. GENERATORS

150 KW Western Elec. 3 brg. 3 wire, 115/230 V, 600 RPM.
75 KW General Electric C. L. Comp. Wound 3 wire 120/240 Volts 850 RPM.
50 KW Milwaukee, Comp. Wound 125 V, 600 RPM.
300 KW Gen. Elect. Synchronous Converter, 6 Phase, type HCC form J, 25 cycle, 750 speed, 220/230 volts.

## FREQUENCY CHANGERS

All sizes, voltages and cycles.

## ★400 H. P. SYNCHRONOUS MOTOR★

**Complete A.C. Synchronous Motor**

1—400 H.P. Wsghse Syn. motor, 3 ph, 60 cy 4000/2300 V, 400 RPM with built-in magnetic clutch. Complete panel mounted reduced voltage type Starting Control. Motor-Generator Set—factory built for excitation and clutch operation. 10 KW, 125 V, DC 1750 RPM, Type SK63, Wsghse, with direct conn. 15 HP, Type CS, 3 ph, 60 cy, 220/440 V.

## 3 ph. 60 cy. A. C. MOTORS

| H.P. | Make | | Type | Speed | Volts |
|---|---|---|---|---|---|
| 300 | Gen. Elec. | Sl. Rg. | I Form M. | 600 | 220/440 |
| 200 | Wsghse. | Sl. Rg. | CW | 900 | 220/440 |
| 200 | Gen. Elec. | Sq. Cg. | I Form K | 514 | 220/440 |
| 175 | Ideal | Sl. Rg. | AVA | 1750 | 2200 |
| 150 | Gen. Elec. | Sq. Cg. | I K | 600 | 2300 |
| 150 | Burke | Sq. Cg. | 3 BRG. 2 ph | 900 | 220/440 |
| 125 | Gen. Elec. | Sq. Cg. | I K | 720 | 220/440 |

## 3 ph. 25 cy. MOTORS

| H.P. | Make | | Type | Speed | Volts |
|---|---|---|---|---|---|
| 830 | Elect. Mach. | | Syn. | 500 | 2300 |
| | With Direct Connected Exciter | | | | |
| 200 | Wsghse. | Sl. Rg. | CW | 485 | 220/440 |
| 200 | Gen. Elec. | Sl. Rg. | I Form M. | 485 | 220/440 |
| 150 | Gen. Elec. | Sl. Rg. | I Form M | 500 | 2200 |
| 100 | Wagner | Sl. Rg. | BR | 750 | 220/440 |
| 100 | Gen. Elec. | Sl. Rg. | I Form M | 750 | 220/440 |
| 100 | Wsghse. | Sq. C. | CS | 500 | 220/440 |
| 75 | Wsghse. | Sq. C. | CC6 | 500 | 220/440 |
| 75 | Triumph | Auto Start | | 750 | 220/440 |
| 75 | Wagner | Sq. C. | BM | 750 | 2200 |
| 75 | Gen. Elec. | Var. | BTA | 375/750 | 440 |

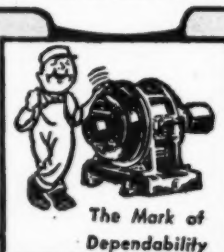
## 230V D. C. MOTORS

| H.P. | Make | Type | Speed |
|---|---|---|---|
| 150 | Burke | Comp. Inter. | 450/700 |
| 105 | Gen. Elec. | CL/6 Shunt Wound | 700 |
| 100 | Sprague | C Interpole | 600 |
| 100 | Northwestern | K30 Comp. Inter. | 1750 |
| 100 | Wsghse. | SK143 Shunt Inter. | 1750 |
| 85 | Gen. Elec. | Vert. Comp. Wound | 700 |
| 40 | Fair. Morse | Ball BRG. Vert. Comp. | 1740 |
| 32 | Sturdevant | C Form P. Shunt Wound | 190 |

***Only partial listing—Write or wire your inquiries***

**OVER 10,000 ITEMS IN STOCK FOR IMMEDIATE DELIVERY FROM EITHER ROCHESTER, N. Y. OR TOLEDO, OHIO REBUILT AND SOLD WITH A STANDARD NEW GUARANTEE.**

**BERGER BROTHERS ELECTRIC MOTORS, Inc.**
395 STATE ST.
ROCHESTER NEW YORK




**THE FRED W. KIEMLE CO.**
33 N. SUPERIOR ST.
TOLEDO OHIO

# THEY THANKED THE LORD WE HAD THE PUMPS

## A good example why we ask you to release idle machinery and equipment NOW

Not long ago in a Pennsylvania town, raging flood waters spilled into homes, rose perilously in the light plant, threatened to plunge the community into darkness. A call was sent out for submersible pumps. We had 50 of them on hand. Everybody at O'Brien worked around the clock rushing pumps, hoses, waterproof cable to the endangered plant. The plant thanked us . . . but the thanks belong to those who originally sold us those pumps. They made our help possible. War plants still need machine tools and power equipment. In order that we may serve these plants . . . and be prepared for emergencies . . . we urge you to sell us all the tools and equipment you do not need. Get in touch with us at once.

**3 phase — A. C. MOTORS — 60 cycle**

| Quantity | HP | Make | Type | Volts | Speed |
|---|---|---|---|---|---|
| 1 | 1200 | Ideal | Syn. | 4000/2300 | 1200 |
| 1 | 500 | GE | MTP | 2300 | 1800 |
| 1 | 400 | GE | IK | 2300 | 514 |
| 1 | 350 | Cr. Wh. | Sl Rg. | 440 | 514 |
| 1 | 250 | Cr. Wh. | Syn. | 440 | 450 |
| 2 | 200 | F. M. | Sl. Rg. | 440 | 600 |
| 1 | 150 | GE | IM | 440 | 720 |
| 1 | 150 | F. M. | Sq. Cg. | 440 | 1800 |
| 1 | 100 | West. | Syn. | 440 | 900 |
| 1 | 75 | GE | IM | 220 | 450 |
| 1 | 75 | GE | IK | 220 | 450 |
| 1 | 75 | Cr. Wh. | Sl. Rg. | 220 | 720 |
| 1 | 75 | GE | ITC | 220 | 900 |
| 1 | 75 | GE | KT537 | 440 | 1800 |
| 1 | 52 | GE | ITC | 440 | 900 |

**MARINE DIESEL ENGINE**

240 HP Fairbanks, Morse Model B 35, 4 cylinder direct reversing, 260 RPM size 14x17. Serial No. 674850. with all trimmings—available for immediate purchase, rebuilt, guar.

**CENTRIFUGAL PUMPS Motor Driven-1800 RPM**

| G.P.M. | MAKE | SIZE | HEAD |
|---|---|---|---|
| 2500 | Frederick | 10" | 80' |
| 1800 | Worthington | 8" | 360' |
| 1600 | DeLaval | 8" | 150' |
| 1600 | Deming | 6" | 90' |
| 1500 | DeLaval | 8" | 40' |
| 1200 | DeLaval | 8" | 60' |

**SPECIAL — NEW 1942 — USED 3 MONTHS**

12—6" Suc. 5" Dis. Deming Fig. 4022 Double Ball Bearing Pumps Cap. 600 GPM at 20 Ft. to 1000 GPM at 47 ft. 5 HP to 15 HP 1750 RPM with A.C. or D.C. Mtr. 3—8" Suc. 6" Dis.. Deming Fig. 4042 Cap. 600 GPM 150 ft. to 1700 GPM 80 ft. 50 HP 1750 RPM.

| G.P.M. | MAKE | SIZE | HEAD |
|---|---|---|---|
| 675 | Penna. | 5" | 346' |
| 600 | Warren | 5" | 460' |
| 450 | Alberger | 5" | 415' |
| 400 | McGowan | 4" | 300' |
| 400 | Worthington | 4" | 60' |
| 100 | Penna. | 2½" | 220' |

**WAR PLANTS, ATTENTION!**

We are in a position to accept a limited number of machine tools, metal-working machinery and electrical equipment for rebuilding for a few plants near Philadelphia. For information or estimates or other details, write immediately.

*Everything from a Pulley to a Power House*

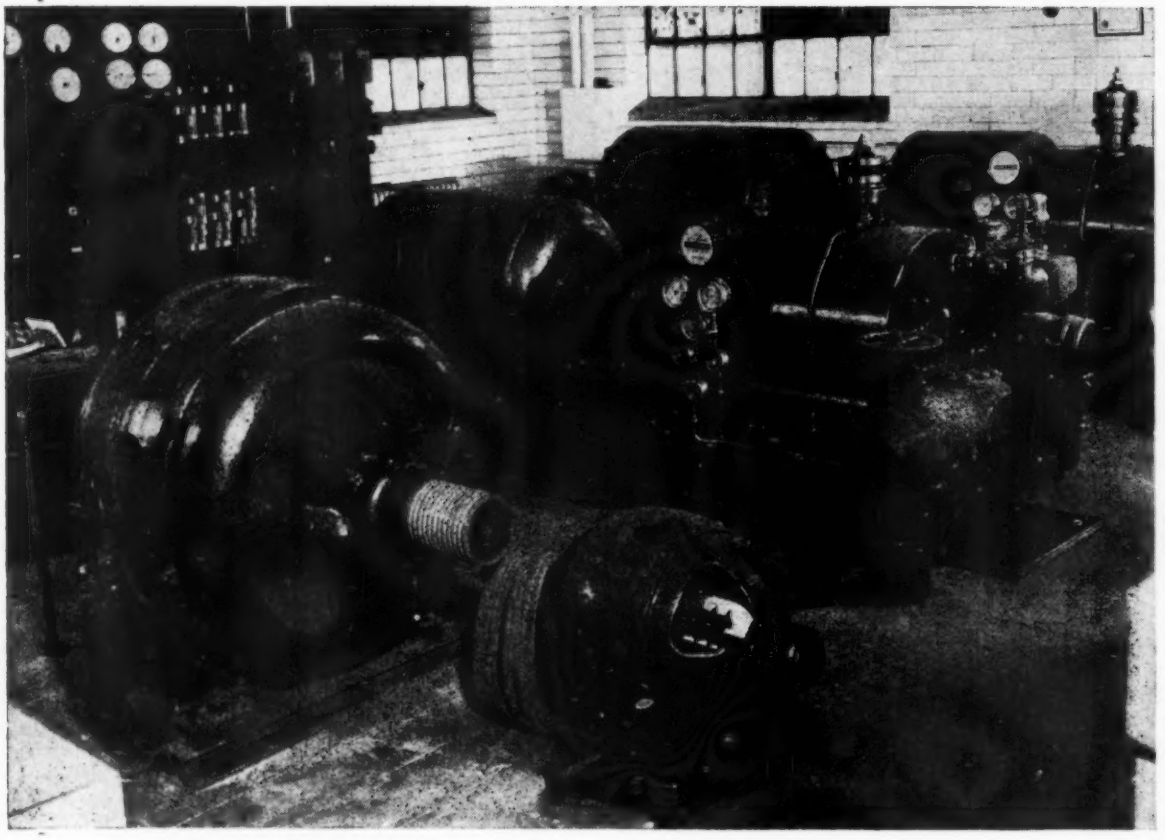
# THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • PHILADELPHIA - PENNA.

BELL TELEPHONE: MARKET 4180 CABLE ADDRESS. OBRIEN-PHILA

# Turbo-Generator Sets



1—500 KW Allis Chalmers .8 p.f. 3 phase, 60 cycle, 240 volts, 1504 amps. 3600 RPM generator, with

1—Allis Chalmers-Parsons turbine, for 150 lb. steam pressure, 100-deg. superheat, 20 lbs. absolute back pressure, with

1—exciter, on same shaft as turbine and generator,

1—300 KW .8 p.f. Allis Chalmers, a.c. generator, 240 volts, 3 phase, 60 cycle, 3600 RPM, 900 amps. with

1—300 KW Allis Chalmers-Parsons turbine, for 150 lb. steam pressure, 100-deg. superheat, 20 lbs. absolute back pressure, with

Westinghouse switchboard equipment consisting of

2—Generator panels, 2" black slate 24" wide 90" high, equipped with

1—type B2 style 2B hand-operated rear mounted oil switch,

3—Rd. pattern AC ammeters,

1—A.C. integrating wattmeter,

1—D.C. field ammeter,

1—Field switch,

2—Plug receptacles for synchroscope and voltmeter,

1—Field rheostat handle with chain and sprocket control for basement-mounted rheostat,

1—Exciter panel,

1—Synchroscope,

1—Westinghouse voltage regulator, type AB-3 on slate panel.

**THIS EQUIPMENT CAN BE SEEN RUNNING. INSPECTION INVITED.**

## WESTERN FELT WORKS

**4113 Ogden Ave.** **Chicago, Ill.**

# REBUILT POWER EQUIPMENT

**READY TO SHIP!**

## ROTARY CONVERTERS

1—200 kw. G. E. 275 v. 900 rpm., 6 ph. 60 cy. complete with overspeed device and transformers.

1—500 kw. G.E. type HC-8 600 volt, 900 rpm., 6 ph., 60 cy. pedestal bearing with overspeed device complete with transformers.

## MOTOR GENERATOR SETS

150 KW Ridgway 250 v. D.C. 900 rpm. dir. con. 2300/3/60 syn. motor, complete.

## ENGINE GENERATOR SETS

225 kw. Elec. Machy. 2200 or 220 v. 2 ph. 60 cy. dir. con. Ideal Steam.

1—225 kw. Elec. Machy. 2200/220 or 440 v. 3 ph. 60 cy., 200 rpm., dir. con. Ideal Engine 4 valve non-releasing.

## 100 HP. LIGERWOOD HOIST

Double drum Speedwell 2500 lb. pull at 450' per min. direct driven by 100 hp. A.C. or D.C. Motor.

## A.C. GENERATORS

219kva. G.E. 2300/3/60 200 rpm. 80% P.F. (Can be reconnected 440 or 220 v.)

1—250 KW, 480 V., 3/60, Allis-Chalmers, 150 rpm.

## D.C. GENERATOR

1—750 KW, 250 V. D.C., 115 rpm., West.

## A.C. MOTORS—3 ph. 60 cy.

| Qu. | Hp. | Make | Type | Volts | Speed |
|---|---|---|---|---|---|
| 1 | 1000 | G.E. | K | 2300 | 509 |
| 1 | 800 | West. | Syn. | 2200 | 450 |
| 3 | 400 | West. | CS | 2200/220/440 | 500 |
| 2 | 250 | G.E. | I-K | 550 | 720 |
| 1 | 250 | G.E. | KT | 220/440 | 1200 |
| 1 | 225 | G.E. | TRE-Syn. | 2200 | 200 |
| 2 | 200 | G.E. | I-K | 220/550 | 600 |
| 1 | 200 | G.E. | I-K | 220/550 | 514 |
| 2 | 200 | G.E. | I-K | 550 | 720 |
| 1 | 200 | West. | CS | 2200 | 870 |
| 2 | 200 | G.E. | I-K | 2200 | 1200 |
| 1 | 200 | G.E. | KT | 2200 | 1800 |
| 1 | 150 | G.E. | I-K | 220/550 | 450 |
| 2 | 150 | G.E. | I-K | 550 | 514 |
| 1 | 150 | G.E. | I-K | 550 | 575 |
| 2 | 150 | G.E. | I-K | 440 | 600 |
| 1 | 150 | Al.-Ch. | | 2200 | 1800 |
| 1 | 125 | G.E. | I-K | 220/550 | 400 |
| 1 | 125 | G.E. | I-K | 440 | 514 |
| 1 | 125 | G.E. | I-K | 440 | 450 |
| 1 | 100 | G.E. | I-K | 220 | 575 |
| 1 | 100 | G.E. | I-K-14 | 220/440 | 720 |
| 1 | 100 | Al.-Ch. | | 220 | 900 |
| 1 | 100 | U.S. | SC | 220/440 | 1160 |
| 2 | 100 | G.E. | | 220/440 | 1770 |
| 1 | 75 | West. | CS | 220 | 600 |
| 2 | 75 | G.E. | | 550 | 720 |
| 2 | 75 | G.E. | I-K | 220/440 | 900 |
| 1 | 75 | G.E. | | 220/440 | 1200 |
| 1 | 75 | West. | CS | 220/440 | 1160 |
| 2 | 75 | G.E. | FT | 220/440 | 1180 |
| 2 | 75 | L.-Al. | OX-505 | 220/440 | 1770 |
| 1 | 60 | Tr'ph. | | 220/440 | 430 |
| 1 | 60 | Cr.Wh. | | 220/440 | 670 |
| 2 | 60 | G.E. | I | 220/440 | 720 |
| 1 | 54 | Al.Ch. | | 220/440 | 900 |
| 1 | 50 | Cr.Wh. | | 220/440 | 1160 |
| 1 | 50 | West. | CCL | 220/440 | 650 |
| 1 | 50/100 | West. | CS | 220/440 | 345/700 |
| 1 | 50/32 | G.E. | POS | 220/440 | 800/640 |
| 2 | 50 | West. | | 220/440 | 600 |
| 1 | 50 | West. | CCL | 220/440 | 850 |
| 1 | 50 | Wag. | | 220/440 | 850 |
| 3 | 50 | G.E. | I | 220/440 | 900 |
| 1 | 50 | Al.Ch. | AN | 220/440 | 1160 |
| 1 | 50 | G.E. | | 220/440 | 1200 |
| 1 | 50 | U.E.El. | | 220/440 | 3600 |
| 1 | 45 | West. | CS | 220/440 | 850 |
| 4 | 40 | Am.El. | | 220/440 | 685 |
| 1 | 40 | G.E. | KT | 220/440 | 720 |
| 1 | 40 | Am.El. | Vert | 440 | 685 |
| 1 | 40 | West. | CS | 220/440 | 600 |
| 1 | 40 | Duq. | | 220/440 | 850 |

## A.C. MOTORS—3 ph. 60 cy.—cont.

| Qu. | Hp. | Make | Type | Volts | Speed |
|---|---|---|---|---|---|
| 2 | 40 | G.E. | KT | 220/440 | 860 |
| 1 | 40 | Tr'ph. | B-12 | 220/440 | 860 |
| 1 | 40 | Al.Ch. | | 220/440 | 900 |
| 1 | 40 | Cent. | AS | 220/440 | 865 |
| 1 | 40 | G.E. | KT336 | 220/440 | 1200 |
| 2 | 35 | West. | | 220/440 | 514 |
| 1 | 35 | Cr.Wh. | | 220/440 | 570 |
| 1 | 35 | G.E. | KT | 220/440 | 600 |
| 2 | 30 | G.E. | KT336 | 220/440 | 865 |
| 2 | 35 | G.E. | I | 550 | 900 |
| 1 | 35 | G.E. | I | 220/440 | 1200 |
| 1 | 35 | Linc. | | 220/440 | 720 |
| 1 | 30/36 | G.E. | KT | 220/440 | 3600 |
| 1 | 30 | G.E. | KT332 | 220/440 | 860 |
| 1 | 30 | Linc. | | 220/440 | 900 |
| 2 | 30 | Al.Ch. | NR | 220/440 | 900 |
| 2 | 30 | West. | MS | | 1100 |
| 1 | 30 | G.E. | KT332 | 220/440 | 1200 |
| 1 | 30 | Cr.Wh. | | 220/440 | 1150 |
| 1 | 30 | Al.Ch. | | 220/440 | 1800 |

## SLIPRING MOTORS—3 ph. 60 cy.

| No. | HP | Make | Type | Volts | RPM |
|---|---|---|---|---|---|
| 1 | 1500 | Westg. | CW | 2200 | 435 |
| 1 | 700 | G.E. | MT-432 | 2200 | 393 |
| 1 | 400 | Westg. | CW | 440/220 | 1170 |
| 1 | 300 | Westg. | CW-1106 | 2200 | 580 |
| 1 | 300 | W. El. | I-12 | 440/220 | 600 |
| 1 | 250 | Westg. | CW | 2200 | 345 |
| 2 | 250 | G.E. | I | 550 | 600 |
| 1 | 100 | G.E. | I | 220 | 450 |
| 1 | 100 | Westg. | CI | 220/440 | 1750 |
| 1 | 75 | Cr.Wh. | | 220/440 | 875 |
| 1 | 60 | Tr'ph | C-16 | 220/440 | 430 |
| 1 | 60 | Westg. | HF | 2200 | 690 |
| 1 | 53 | G.E. | I | 220/550 | 1165 |
| 1 | 52 | G.E. | ITC5012 | 220/440 | 900 |
| 1 | 50 | G.E. | MT556 | 440/220 | 430 |
| 1 | 50 | Westg. | HF | 440/220 | 860 |
| 1 | 50 | Al.Ch. | | 440/220 | 900 |
| 2 | 50 | Westg. | HF | 220/440 | 1120 |
| 2 | 50 | Westg. | CW636A | 440/220 | 1150 |
| 2 | 40 | G.E. | MT | 220/440 | 1155 |
| 1 | 40 | G.E. | I | 440/220 | 1200 |
| 1 | 25 | Westg. | MW | 220/440 | 680 |
| 1 | 25 | G.E. | I | 440/220 | 670 |
| 1 | 25 | Westg. | CI | 220/440 | 900 |

## D.C. MOTOR

11—800 HP. West., 650 V. D.C., 370 rpm.

## TRANSFORMERS—1 ph. 60 cy.

3—1500 Kva. Pittsburgh Transformers, 22,000 volt Primary, 6900/6600/2200 volt secondary.

| No. | Kva. | Prl. | Sec. | Make | Ph. |
|---|---|---|---|---|---|
| 1 | 250 | 2300 | 460 | G.E. | |
| 3 | 150 | 22000 | 6900 | Pgh. | |
| 1 | 150 | 2200 | 230/460 | G.E. | 3 ph. |
| 1 | 100 | 2200 | 110/220 | G.E. | |
| 3 | 100 | 6600 | 550/440/220 | Pgh. | |
| 2 | 75 | 2200 | 220 | Burke | 3 ph. |
| 2 | 50 | 2300 | 220/440 | G.E. | |
| 3 | 50 | 11430/6600 | 550 | Al. Ch. | |
| 3 | 50 | 6600 | 575 | G.E. | |
| 1 | 37½ | 2300 | 220/440 | Wagner | |
| 3 | 37 | 4400 | 185 | West. | (Rotary) |
| 1 | 30 | 2200 | 110/220 | G.E. | |
| 2 | 30 | 440 | 220/110 | West. | |
| 25 | 25 | 2200 | 122/244 | G.E. | |
| 3 | 15 | 2200 | 122/244 | G.E. | |
| 35 | 10 | 2200 | 122/244 | G.E. | |
| 40 | 10 | 2200 | 122/244 | West. | |
| 100 | 7½ | 2200 | 122/244 | G.E. | |
| 50 | 7½ | 2200 | 122/244 | West. | |
| 50 | 5 | 2200 | 122/244 | G.E. | |
| 75 | 5 | 2200 | 122/244 | West. | |

## SERIES MOTORS

| Qu. | HP | Make | Type | RPM | ¾Volts |
|---|---|---|---|---|---|
| 1 | 175 | G.E. | MD-109 | 475 | 230 |
| 1 | 50 | Westg. | K-10 | 435 | 500 |
| 1 | 15 | Cr.Wh. | SM-58 | 270 | 230 |
| 1 | 10 | Westg. | | 1100 | 500 |
| 1 | 10 | G.E. | CQ | 650 | 230 |
| 3 | 10 | G.E. | CO-2504 | 700 | 110 |
| 3 | 7½ | Cr.Wh. | AW | 800 | 230 |
| 1 | 5 | Imp. | | 540 | 250 |
| 3 | 3½ | Westg. | | 600 | 250 |
| 6 | 2 | Reliance | HZ | 850 | 230 |
| 2 | 1 | Westg. | CD-923 | 900 | 230 |

## VARIABLE SPEED MOTORS—230 V. D.C.

1— 2 HP G.E. type FC-33 500/2000 rpm.
1— 2 HP G.E. 500/1500 rpm.
1— 2 HP Westg. type SK-9 1150/2300 rpm.
3—2½ HP G.E. 500/1000 rpm.
1—2¾ HP Westg. type SK-20 900/1800 rpm.
2— 3 HP Jantz Liest 650/1900 rpm.
1—3¼ HP Westg. type SA 400/1600 rpm.
1—3½ HP Westg. type SK-30 850/1700 rpm.
1— 5 HP G.E. type CD-85 450/1800 rpm.
1— 5 HP G.E. type LC 990/1500 rpm.
1— 5 HP Sprague 850/1500 rpm.
3—7½ HP Cr. Wh. 385/1000 rpm.
2— 7½ HP Westg. type SK-6 495/990 rpm.
1—10 HP Westg. type S 565/1130 rpm.
2—10 HP G.E. type LC 625/1250 rpm.
1—10 HP G.E. type CD-95 450/900 rpm.
1—10 HP Reliance 110 v. 450/1800 rpm.
1—20 HP Westg. type SK-120 700/1400 rpm.
1—30 HP Westg. type SK-123 850/1275 rpm.
1—35 HP West., SK-140, 675/1350 rpm.
1—30 HP West., SK-123, 850/1700 rpm.
1—25 HP Al. Ch., NS, 1150/1450.
1—20 HP West., SK-120, 700/1400.
2—10 HP G.E., 625/1250.
1—10 HP West., 635/1130.
1— 5 HP G.E., LC, 990/1500.
1— 5 HP G.E., CD, 450/1800.
1—3¼ HP West., 400/1600.
2— 3 HP West., SK-33, 650/1950.
3—2½ HP G.E., 500/1000.
1—200 West., type SK, 440/880 rpm.

## 25-30 cy. MOTORS 220/440 V. A.C.

| Qu. | HP | Make | Type | RPM |
|---|---|---|---|---|
| 1 | 75 | G.E. | I-4 | 900 |
| 1 | 75 | G.E. | KT-357 | 900 |
| 1 | 75 | Allis-Chalmers | AN | 900 |
| 3 | 50 | G.E. | KT-547 | 900 |
| 3 | 40 | G.E. | KT-347 | 900 |
| 6 | 40 | Allis-Chalmers | AN | 900 |
| 1 | 35 | Western Elec. | 8L13B | 500 |
| 1 | 35 | West. | M | 900 |
| 1 | 30 | West. | C | 720 |
| 1 | 30 | G.E. | KT | 900 |
| 7 | 30 | Allis-Chalmers | AN | 900 |
| 2 | 25 | West. | MS | 715 |
| 9 | 10 | Allis-Chalmers | AN | 900 |
| 1 | 10 | G.E. | 1-4-10 | 900 |
| 1 | 5 | G.E. | MT | 695 |
| 1 | 3 | West. | CS | 1450 |
| 1 | 3 | Western Elec. | CL7 BA | 1500 |
| 1 | 3 | G.E. | K | 1430 |
| 1 | 3 | G.E. | KT | 715 |
| 2 | 2 | G.E. | K | 1410 |
| 1 | 2 | West. | CS | 710 |
| 1 | 2 | Hawthorne | CL7 AA | 750 |
| 1 | 2 | West. | CS | 695 |
| 1 | 1 | West. | CSA | 750 |
| 1 | ¼ | Century | | 1460 |

## DIESEL ENGINE GENERATOR SET

217 KVA G.E. 2300/3/60 dir. con. 260 HP Buckeye 2 cyl. 200 rpm. semi-diesel engine, complete.

## INDUSTRIAL TRUCKS

1—Baker Tow Truck—8' long—64" high—48" wide—Ground to coupling 16, 18, 21, 23—4—19" wheels—coupling on frame 19" from ground.

3—Elwell Parker Tow Tractors 7' L. x 42" W. x 42" H. 4-16" wheels, ball bearing 4 wheel steer, 4 wheel drive, 2000-lb. DBP complete with Edison Batteries.

## SCALES

6—Fair. Morse ⌀11½ 3 beams (2—200# ea. 1—50 lbs.) platform 16¼x21¾.

9—Howe Scales 3 beams—platform 14½x22.

***WRITE, WIRE OR PHONE YOUR ELECTRICAL REQUIREMENTS***

# DUQUESNE ELECTRIC & MFG. CO.

## PITTSBURGH, PA.

# The HEAT is on — America needs more POWER

## TWO COMPLETE POWER PLANTS

*FORMERLY OWNED BY*

## VULCANITE PORTLAND CEMENT CO.

***ALPHA, NEW JERSEY—3 miles from Phillipsburg, N. J., and Easton, Pa.***

### PLANT NO. 2

2—800 HP Edgemoor Waste Heat Boilers 200# pressure complete with Economizers, Super Heaters, motor driven blowers and steel stacks.

2—1000 HP Cochrane Feed Water heaters.

Complete coal pulverizing department consisting of:

3—Fuller Lehigh Pulverizers, Ruggles 5' x 30' Rotary dryer, conveyors, elevator, etc.

1—20 x 36 x 42 Horiz. Cross Comp. Corliss Engine.

3—Horizontal Cross Compound direct connected to 230 volt DC Generators 100 RPM, one 400KW, one 450 KW, one 575 KW.

1—Ingersoll Rand Air Compressor, horizontal duplex 18¼ x 14 x 18, belted motor drive.

### PLANT NO. 3

3—800 HP B & W Straight Tube Waste Heat Boilers, 200# pressure complete with Economizers, motor driven induced draft fans, and steel stacks.
2—400 HP B & W Straight Tube Water Tube Boilers, 200# pressure complete with Combustion Engineering Type E stokers and induced draft fans.
Complete Coal Pulverizing Department consisting of:
4—Fuller Lehigh Pulverizers—Jeffreys 24 x 24 Coal Crusher, Ruggles 6' x 41' Rotary Dryer, Conveyors, elevators, etc.
1—Cochrane Feed Water Heater.
2—Steam driven Feed Water Pump 14 x 20 x 22 x 15.
1—Cameron Centrifugal Feed Water Pump m. d., 150 HP.
1—Cooper Tandem Comp. Corliss Engine 24 x 54 x 48.
1—Cooper Tandem Comp. Corliss Engine 20 x 44 x 48.
3—Horizontal Cross Compound Corliss Engine direct connected to 230 volt DC Generators, one 800 KW, one 750 KW, one 400 KW.
1—Ingersoll Rand Air Compressor, horizontal duplex 11 x 16; 18 x 16, belted motor drive.

***Representative on premises. Phone Phillipsburg, N. J., 5-1111***

## CHECK THESE ITEMS FOR IMMEDIATE DELIVERY

### MOTORS

**230 V. DIRECT CURRENT**

| Q. | H.P. | Make | Type | R.P.M. |
|---|---|---|---|---|
| 1 | 300 | ELEC. DYN. | | 500 |
| 1 | 150 | WSGHSE | SK. | 1750 |
| 1 | 125 | GEN. ELEC. | DLC | 550 |
| | | **3 PH. 60 CYCLE AC 220/440 VOLT** | | |
| | | **SQUIRREL CAGE** | | |
| 1 | 125 | Cr. Wh. | 125Q | 900 |
| 1 | 50 | GEN. ELEC. | KT327 | 1800 |
| 1 | 50 | WAGNER | 22VRM | 600 |
| | | **SLIP RING** | | |
| 2 | 150 | Al. Ch. | | 600 |
| 1 | 150 | WSGHSE | H.F. | 495 |
| 1 | 50 | WSGHSE | CW758 | 720 |
| | | **SYNCHRONOUS** | | |
| 1 | 450 | WSGHSE | 550 | 600 |
| 1 | 268 | GEN. ELEC. | 2300 | 600 |
| 1 | 125 | WSGHSE | 2400 | 900 |

*Hundreds of other motors from 1 HP up.*

**BOILERS AND STOKERS**

2—253 HP Heine Water Tube Boilers 160# pressure, ASME code
1—Jones 300 HP 3 Retort underfeed stoker, Steam actuated ram type

**CONDENSER**

1—C. H. Wheeler 3650 Square Feet Surface Condenser 2 pass, complete with pumps

**GENERATOR**

45 KW Diehl Cpd. Int. 550 RPM 230 V. D. C. Generator

**★ MISCELLANEOUS**

1—16 ton 50 ft. span overhead travelling crane, hand operated
Large lot leather belting (approx. 7 tons) all sizes
Large lot new bronze valves 2" to 4"
Steam pumps—Sump pumps

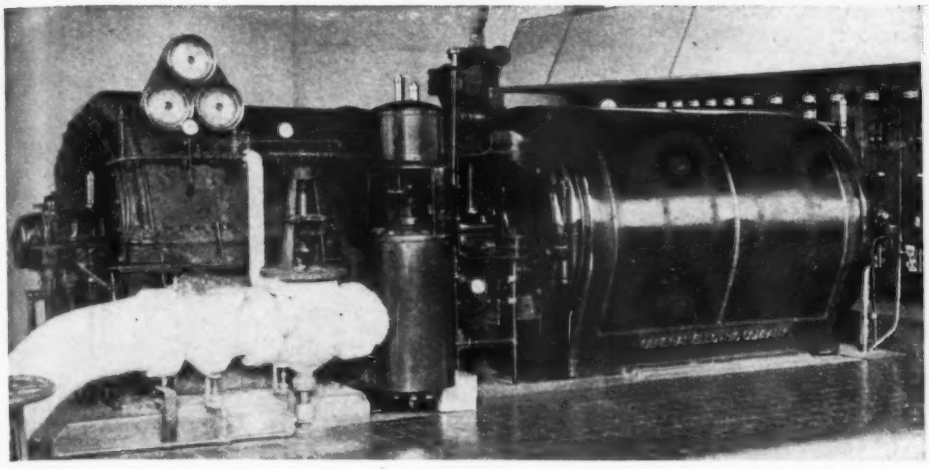
**• TUBES** 7,500 Condenser Tubes 1" OD 20 Gauge Admiralty 18 ft., long like new

*Send for Bulletin #100*

## HEAT and POWER Company, Inc.

**45 BOND STREET** **Phone: ALgonquin 4-3874** **NEW YORK, N. Y.**

# 2500 KW CONDENSING TURBINE-GENERATOR UNIT



## AVAILABLE IMMEDIATE DELIVERY

**3125 KVA—2500 KW 80% P. F., General Electric, 3 phase, 60 cycle, 2300 volts, 3600 RPM, 180-200 lbs., pressure, 500 degree total temperature, equipped with surface condenser, condensing auxiliaries, panels and instruments. A complete installation.**

### TURBINE-GENERATOR UNITS

**3 Phase, 60 Cycle**

6250 KVA Westinghouse condensing 175-200 lb. pressure, 2300 volts, complete with surface condenser and auxiliaries.

1875 KVA General Electric condensing 175-200 lb. pressure, 500° T.T., 2300 volts, 3600 RPM complete with surface condenser.

1250 KVA General Electric condensing 200 lb. pressure, 500° T.T., 2300 volts, 3600 RPM complete with surface condenser.

937 KVA General Electric condensing 200 lb. pressure, 100° SH, 2300 volts, 3600 RPM complete with condenser, exciter, switchboard and instruments.

937 KVA Allis condensing 150 to 200 lb. pressure, 475° T.T., 2300 volts, 3600 RPM, complete with direct connected exciter, surface condenser and auxiliaries.

625 KVA General Electric condensing 200 lb. pressure, 2300 volts, 3600 RPM, complete with condenser and auxiliaries.

375 KVA General Electric condensing 150-200 lb. pressure, 100° SH, 2300 volts, 3600 RPM complete with surface condenser and auxiliaries.

375 KVA (2) General Electric non-condensing, 150-175 lb. pressure, 5 lb. back pressure, 2300 volts, 3600 RPM each complete with direct connected exciter and rheostats.

87.5 KVA Allis non-condensing 125 to 150 lb. pressure, 7 to 10# back pressure, 480 volts, 3600 RPM, complete with exciter and rheostat.

### ENGINE-GENERATOR UNITS

**Direct Current**

1000 KW Westinghouse, 250 volts, 514 RPM generator direct connected through reduction gear to Westinghouse condensing turbine, 150-200 lb. pressure, equipped surface condenser.

600 KW Crocker-Wheeler 250 volts, 300 RPM generator direct connected to a 14" x 18", 4 cylinder Ames vertical Unaflow non-condensing engine, 150-175 lb. pressure, 5 lb. gauge back pressure, complete switchboard and instruments.

300 KW Westinghouse 250 volts, 175 RPM generator direct connected 24" x 26" Skinner Unaflow non-condensing engine, 110-150 lb. pressure, 5 lb. back pressure.

150 KW Crocker-Wheeler, 125 volts, 200 RPM generator direct connected to an Erie Ball single cylinder, 4-valve, non-releasing Corliss engine complete with switchboard.

### ENGINE-GENERATOR UNITS

**3 phase, 60 cycle—**

**Alternating Current**

438 KVA G.E. 2300 volts, 200 RPM generator direct connected Busch Sulzer vertical full Diesel engine.

312 KVA Elliott 4000/2300/550 or 240 volts, 180 RPM generator direct connected 17" x 24" Elliott Unaflow non-condensing engine, 175 lb. pressure, 6 lb. gauge back pressure.

300 KVA G.E. 240 volts, 120 RPM generator direct connected 18" x 36" Hamilton Corliss engine, 125-150 lb. pressure, 5 lb. gauge back pressure, complete with exciter.

135 KVA G.E. 2300 volts, 277 RPM generator direct connected Busch Sulzer vertical full diesel engine.

### MOTOR GENERATOR SETS

1500 KW Allis-Chalmers, 600 volt direct current generator direct connected to 2190 HP, 3 phase, 60 cycle, 4000/6600 volts, 300 RPM synchronous motor.

100 KW Triumph 250 volts direct current generator direct connected to 150 HP, 3 phase, 60 cycle, 2300 volts, 900 RPM squirrel cage motor.

30 KW G.E. 125 volts direct current generator direct connected to 50 HP, 3 phase, 60 cycle, 2300 volts, 720 RPM squirrel cage motor.

13.5 KW G.E. 125 volts direct current generator direct connected 20 HP, 3 phase, 60 cycle, 440 volts, 900 RPM squirrel cage motor.

### MOTORS—

**3 phase, 60 cycle**

1500 HP Allis-Chalmers, 2300 volts, 200 RPM slip ring.

625 HP G.E. type ATI, 2200 volts, 257 RPM synchronous.

620 HP G.E. type ATI, form S, 440 volts, 164 RPM synchronous.

600 HP Westinghouse, 2200 volts, 345 RPM slip ring.

150 HP (5) G.E. form K, 2200 volts, 580 RPM, in the 4 million series, each complete with G.E. automatic compensator.

125 HP 80% P.F. Elec. Mchy. 440 volts, 400 RPM synchronous with starting equipment.

50 HP G.E. type I, form M, 2200 volts, 1200 RPM slip ring.

50 HP Allis-Chalmers, 440 volts, 600 RPM squirrel cage.

### MISCELLANEOUS

1200 KVA G.E. 3 phase, 60 cycle, 2400 volt, 300 RPM alternating current generator direct connected to a 1700 HP, 3 phase, 25 cycle, 2300 volt synchronous motor.

725 HP Heine water tube code boiler, gas fired, 250 lb. pressure—complete.

500 KVA Ideal, 3 phase, 60 cycle, 240 volts, 400 RPM, three-bearing belted type generator with direct connected exciter and rheostats.

200 KVA Westinghouse, 3 phase, 60 cycle, 240 volts, 200 RPM engine type generator with rheostat.

30 KW G.E. 125 volts, 625 RPM, type RC compound wound direct current generator.

1—Elliott jet condenser with auxiliaries suitable for a 5000 KW turbine-generator unit.

1055 cubic feet, 100 lb. air pressure Chicago Pneumatic horizontal compressor direct connected to 170 HP, 240 volt, 150 RPM General Electric direct current motor.

### SynchronousCondensers 1350 KVA Total Capacity

**750 KVA and 600 KVA General Electric, type ATI, 3 phase, 60 cycle, 240 volts, 900 RPM synchronous condensers. Each unit complete with direct connected exciter, switchboard panel with instruments. Are in A#1 operative condition—still on original foundation for operating test.**

**Utilities Electrical Machinery Corporation**

600 NATIONAL CITY BANK BLDG.
CLEVELAND, OHIO

WIRE OR PHONE
LONG DISTANCE 422

# Let MacCABE lift your Worries!

## OVERHEAD ELECTRIC TRAVELING CRANES

| | Tons | Make | Span | Current |
|---|---|---|---|---|
| (2) | 1 | Euclid | 20'0" | 115/230-VDC. |
| (2) | 1 | Maris | 35'7" | 230-VDC. |
| (1) | 2 | P & H | 34'8" | 230-VDC. |
| (2) | 3 | Sprague | 20'6" | 230-VDC. |
| (1) | 3 | Armington | To Suit | 230-VDC. |
| (1) | 3 | Euclid | 30'0" | 220/440-VAC. |
| (1) | 5 | Shepard Niles | 30'0" | 230-VDC. |
| (1) | 7½ | P & H | 38'0" | 230-VDC. |
| (1) | 10 | Whiting | 32'0" | 220/440-VAC. |
| (1) | 10 | Toledo | 33'0" | 230-VDC. |
| (1) | 10 | P & H | 38'0" | 230-VDC. |
| (1) | 10/5 | Chesapeake | 38'0" | 230-VDC. |
| (1) | 12 | Morgan | 58'0" | 230-VDC. |
| (1) | 25 | Milwaukee | 48'0" | 230-VDC. |
| (1) | 25 | Niles | 35'0" | 230-VDC. |
| (1) | 25 | P & H | 50'0" | A.C. or D. C. |
| (1) | 40 | P & H | 50'0" | 230-VDC. |

## ELECTRIC TRAVELING GANTRY CRANES

(1)-3-ton Milwaukee 3-motors, cage operated, 31'3" between legs, 13'3" overhang each end, 25'0" lift, (Rebuilt either 230-VDC. or 220/440-VAC.), suitable for 5-ton cap., drum parallel with bridge girders, used with single line bucket (bucket available).

(2)-Shaw one leg Gantries, 3-motors, cage operated, 230-VDC., (1)-5-ton cap., (1)-10-ton cap., 20'7½" span, 10' overhang one end.

(1)-15-ton McMyler Gantry, 5-ton high speed Aux. Hoist, 80'0" span, 30'0" lift, 4-motors, cage operated, (still erected) for easy inspection and quick shipment), now 550-V., 3-phase, 25-cycle. We can furnish this Rebuilt for 230-VDC. or 220/440-V., 3-PH, 60 CY.

(1)-50-ton Morgan Gantry, (2)-25-ton trolleys, 230-VDC., cage operated, 60'0" between legs, 50' cantilever extension each end, total bridge length 160', 35' lift, including 3400' of rail, ties, 3400' #40 bare copper wires with supports, (Available for Immediate Shipment, Still Erected).

## 230-V.D.C. CRANE & MILL MOTORS

| | H.P. | Make | Type | R.P.M. |
|---|---|---|---|---|
| (1) | 1 | P & H | Size 5½x3½ | 850 |
| (1) | 2 | P & H | | |
| (1) | 2 | Shaw W | B.E. | 930 |
| (2) | 2½ | Westghse | Type K-1 | 930 |
| (1) | 2½ | Reliance | Type T | 1600 |
| (2) | 2½ | G.E. | C.O. 2502 | 750 |
| (1) | 3½ | G.E. | C.O. 2503 | |
| (6) | 2½ | G.E. | C.O. 2505 | 850 |
| (1) | 6 | C.W. | S.M. | 930 |
| (15) | 6-7½ | G.E. | C.O. 1805 | 850/1150 |
| (1) | 7½ | Westghse | M.T.-000 | Back Axle |
| (1) | 7 | G.E. | M.D.-102 | 1000 |
| (10) | 10 | G.E. | C.O. 1806 | 700 |
| (1) | 10 | P & H | | |
| (2) | 10 | G.E. | M.D.-2504 | 700 |
| (1) | 10¾ | C.W. | S.M. size | 616-810 |
| (2) | 10 | Westghse | K-5 | 700 |
| (15) | 15 | G.E. | C.O.-1807 | 650 |
| (1) | 19 | C.W. | B.W. | Mill type |
| (1) | 20 | G.E. | C.O. 1806 | 850 |
| (1) | 25 | G.E. | C.O. 1809 | 700 |
| (1) | 25 | G.E. | Type 52 | |
| (2) | 20/30 | G.E. | M.D.-104 | 725/875 |
| (4) | 30/45 | G.E. | M.D.-104½ | 625/500 |
| (1) | 50 | Shaw | Type Z | 550 |
| (2) | 50 | G.E. | C.O.-1810 | 550 |
| (3) | 65/85 | G.E. | C.O. 1830 | 700/650 |
| (2) | 65/85 | G.E. | C.O. 1811 | 700/550 |
| (1) | 100 | G.E. | C.O. 1812 | 700 |
| (1) | 1150 | Westghse | MCB | 365 |

(250) Drum Controllers (G. E. Westinghouse, C. H.) EC&M Dinky type, with and without resistors, 5 to 100-HP. for many of the above motors and for sale separately. (Send Us Your Controller Specifications).

SPECIAL: 25-sets G. E. controllers, R-177-A each with 20 to 30 and 30 to 45-HP. resistors.

As we operate the largest plant in the country exclusively Rebuilding all kinds of Overhead & Gantry Cranes, Hoists, Crane & Mill Electrical equipment, we can rebuild and adjust most of the cranes noted above to your requirements.

(Send Us Your Inquiries for All Kinds of Electrical Equipment)

## T. B. MacCABE COMPANY

4306 CLARISSA STREET PHILADELPHIA, PA.

# THE PICK OF POWER EQUIPMENT

### TURBO UNITS—60 Cy.

1—18750 KVA Westinghouse Cond.
1—12500 KVA Westinghouse Cond.
1—12000 KW General Electric Cond.
1—6250 KVA General Electric Cond.
1—4000 KW General Electric Cond.
1—3125 KVA General Electric Cond.
1—1250 KVA General Electric Cond
1—937 KVA General Electric Cond.
1—750 KVA General Electric Cond.
1—375 KVA General Electric Cond.
1—250 KVA General Electric Cond.
1—2500 KVA General Electric Non-C.
2—1250 KVA General Electric Non-C.
1—938 KVA West. 375# I.P. 100# B.P. N-C.
1—625 KVA General Electric Non-C.
1—312 KVA Moore-Non-Condensing
1—250 KVA Westinghouse Non-C
1—125 KVA Westinghouse Non-C.

### STEAM ENGINE UNITS—60 Cy.

1—1667 KVA Nordberg Uniflow
1—325 KVA Skinner Uniflow
1—300 KVA Hamilton 4-valve
1—250 KVA Ridgway 4-valve
1—210 KVA Skinner Uniflow
1—187 KVA Chuse Uniflow
1—94 KVA Ridgway 4-valve

### DC STEAM ENGINE UNITS

1—500 KW Skinner Uniflow 250 V.
1—350 KW Ridgway 4-valve 250 V.
1—300 KW Skinner Uniflow 250 V.
1—300 KW Erie City 4-valve 250 V.
1—200 KW Ridgway 4-valve 250 V.
1—150 KW Ames Uniflow 125 V.
1—125 KW Ridgway 4-valve 250 V. 3-wire
1—100 KW Ames Uniflow 120 V.
1—100 KW Elliott 4-valve 250 V. 3-wire
1—75 KW Skinner Uniflow 250 V.
1—50 KW Ames Uniflow 125/250 V. 3-wire

### SYNCHRONOUS MOTORS—60 Cy.

1—1000 HP Westinghouse 2300 V. 900 RPM
1—750 HP Westinghouse 2300 V. 720 RPM
1—700 HP General Electric 2200 V. 1800 RPM
1—175 HP General Electric 230 V. 225 RPM
1—175 HP General Electric 220 V. 200 RPM
1—150 HP General Electric 440 V. 164 RPM
1—100 HP General Electric 2300 V. 240 RPM

### OIL & GAS ENGINE UNITS—60 Cy.

1—1000 KVA Cooper(gas) 240 V.
1—720 KW McInt.-Seymour 2300 V.
1—400 KW West. (gas) 440 V.
1—312 KVA Anderson 2400 V.
1—121 KVA Fairbanks Morse 240 V.
1—57.7 KVA Fairbanks Morse 240 V.
1—49.5 KVA Fairbanks Morse 120 V.
1—32 KVA Fairbanks Morse 120 V.

### WATER TUBE BOILERS

2—1000 HP Heine 250-lb. Oil Fired
1—800 HP Connelly 250-lb. Stoker
1—750 HP Edge Moor 200-lb.
6—600 HP Stirling 180-lb. Stokers
6—600 HP B. & W. 160-lb. Stokers
2—490 HP Stirling 200-lb.
8—400 HP Stirling 200-lb.
2—350 HP Stirling 200-lb.
2—336 HP B. & W. 200-lb. McClave-Brooks Stokers
1—306 HP Heine Marine 165-lb.
1—300 HP Erie City 160-lb.
1—253 HP Stirling 180-lb.
2—250 HP Heine 160-lb.

### INDUCTION MOTORS—60 Cy.

4—3500 HP G. E. slip ring 2300 V. 120 RPM
1—800 HP West. slip ring 440 V. 353 RPM
2—800 HP G. E. slip ring 2300 V. 300 RPM
1—600 HP G. E. sq. cage 440 V. 900 RPM
2—400 HP G. E. slip ring 3800 V. 1800 RPM
2—300 HP G. E. sq. cage 440 V. 600 RPM
2—250 HP G. E. sq. cage 4000 V. 1200 RPM
1—250 HP G. E. slip ring 2200 V. 450 RPM
3—50-150 HP West. 2200 V. 343-679 RPM

### MOTOR GENERATOR SETS—60 Cy.

1—1500 KW General Electric 600 V. DC
1—1000 KW General Electric 600 V. DC
2—500 KW General Electric 600 V. DC
1—75 KW General Electric 125-V. DC

### ROTARY CONVERTERS—60 Cy.

1—1500 KW Westinghouse, 250 V.
2—1000 KW Westinghouse, 250 V.
1—1000 KW Westinghouse, 600 V.
1—750 KW Westinghouse, 600 V.
1—500 KW General Electric, 250 V.
1—500 KW General Electric, 600 V.
2—300 KW General Electric, 600 V.

### OIL CIRCUIT BREAKERS

1—800 A. 87 KV Am.Br.Bov. AF22 Outdoor
2—600 A. 73 KV West. G222AS Outdoor
1—400 A. 73 KV G. E. FK036 Outdoor
6—400 A. 37 KV G E. FHKO 136 Outdoor
4—400 A. 34.5 KV Condit F-16-A Outdoor
2—1000 A. 30 KV Kelman CB-76 Outdoor
4—600 A. 25 KV West. CO-2 Outdoor
2—600 A. 15 KV Kelman CB-76 Outdoor
4—600 A. 15 KV G. E. FKO-60-B Outdoor

### FREQUENCY CHANGERS

2—3125 KVA West. 25/62½ cy. 750 RPM
1—3000 KVA G. E. 60/25 cy. 300 RPM
1—2500 KVA West. 25/60 cy. 300 RPM
1—1500 KW G. E. 25/60 cy. 300 RPM
1—1250 KVA G. E. 25/62½ cy. 750 RPM
1—1000 KVA G. E. 60/25 cy. 514 RPM
1—1000 KW G. E. 25/60 cy. 300 RPM
1—750 KVA G. E. 25/60 cy. 300 RPM

### SYNCHRONOUS CONDENSERS

1—2000 KVA G. E. 11000/2200 V. 720 RPM
1—2000 KVA C. W. 11000 V. 600 RPM
1—1000 KVA G. E. 2300 V. 900 RPM
1—500 KVA West. 2200 V. 900 RPM

### TRANSFORMERS 1 Ph. 60 Cy.

3—600 KVA West. 120,000/2300 V.
3—200 KVA G. E. 66000/13200-22800 V.
3—500 KVA Allis 33000*480 V.
3—250 KVA Penn 34500-17250/4600-2300 V.
3—75 KVA G. E. 33000/13200-11000 V.
2—10000 KVA G. E. 26400/4580 V. 3 ph.
1—6000 KVA G. E. 26400/2300 V. 3 ph.
3—1500 KVA Pitts. 22000/6600 V.
3—1000 KVA G. E. 23000-11500/575 V.
3—667 KVA West. 22000-11000/230 V.
3—250 KVA G. E. 22000/11000 V.
1—10000 KVA Pitts. 13200/4600 V. 3 ph.
1—5000 KVA American 13800/2300 V.
3—450 KVA G. E. 13200/240-480 V. 3 ph.
3—200 KVA G. E. 13200/2300 V.
3—150 KVA Pitts. 11000/2400 V.
3—100 KVA West. 11000/250-125 V.
3—1250 KVA G. E. 6600/550 V.
3—1000 KVA Pitts 2300-4600/550 V.
3—1000 KVA Kuhlman 2300/220 V.
3—667 KVA G. E. 2300-4000Y/500-480-460 V.
3—150 KVA G. E. 2400-4160/240-120 V.
3—100 KVA Pitts. 2300/575 V.

*PARTIAL LIST—WE HAVE ALL CLASSES OF POWER EQUIPMENT*

## BREW, WOLTMAN & Co., INC.

50 CHURCH STREET, NEW YORK CITY

# DEPENDABLE

# Turbo-Generators

## A PARTIAL LIST OF OUR INVENTORY

1—G.E. 3125-KVA, 3600-RPM, Condensing: 3/60/2300-v, 200#, 100° SH, 28" vacuum: Surface or Low Level Jet Condenser.

1—Westinghouse 2500-KVA, 3600-RPM, Condensing: 3/60/600-v, 200#, 100° SH, 28" Vacuum: Low Level Jet Condenser.

1—G.E., 1875-KVA, 3600-RPM, Condensing: 3/60/600-v, 200#, 100° SH, 28" Vacuum: Surface or Jet Condenser.

1—G.E., 1563-KVA, Non-condensing 3600-RPM, 3/60/600-v: 150#, 100° SH, 20# back pressure.

1—Allis-Chalmers 1250-KVA, 3600-RPM, 3/60/2300-v, 200#, 500° TT: Surface Condenser.

1—Westinghouse, 1000 K.W. 250-v, direct current, condensing, 150/250-Lbs., Surface Condenser.

1—Allis-Chalmers 937-KVA, 3600-RPM, Condensing: 3/60/2300-v, 200#, 500° TT: Surface Condenser.

1—G.E., 625-KVA, 3600-RPM, Condensing: 3/60/2300-v, 200#, 500° TT, 28" vacuum.

1—G.E., 250-KVA, Non-condensing, 3600-RPM: 3/60/480-v, 150#, 0° SH, 28" Vacuum, 10# G. back pressure.

WILMS, WEAVER & CO. Penobscot Building DETROIT, MICH.

*We Deal in Turbo-Generators Exclusively*

# POWER PLANT EQUIPMENT CO., INC.

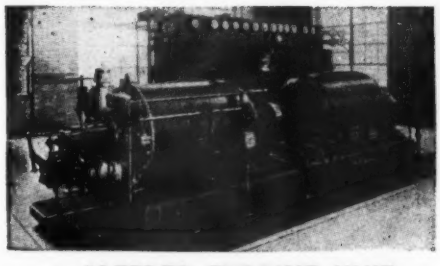
39 Cortlandt Street
New York, N. Y.

### A C TURBINE UNITS

9375 KVA G.E. 5000/2300 V. Cond.
6250 KVA. G.E. 2300 V. Cond.
2500 KVA G.E. 2300 V. Cond.
1875 KVA Al. Chal. 2300 V. Cond.
1500 KVA Al. Chal. 480 V., low press.
1250 KVA G.E. 2300 V. Cond.
1000 KVA Wghse. 2 ph., 600 V. Cond.
937 KVA Al. Chal.-Moore 480 V., Non-Cond. and bleeder
937 KVA Al. Chal. 2300 V. Cond.
937 KVA Al. Chal.-Elliot Mixed Pres.
780 KVA Al. Chal. 2300 V. Con.
780 KVA Al. Chal.-Terry 600 V.; Auto bleeder
625 KVA Wghse. 2300 V. Cond.
625 KVA G.E. 2300 V. Cond.
625 KVA Al. Chal.-Elliot 240/480 V. Auto bleeder
375 KVA G.E. 2300 V. bleeder
375 KVA G.E. 2300 V. Non-Cond.
312 KVA Ridgway-Elliot 480 V. Cond.
250 KVA G.E.-Moore; Auto Bleeder
150 KVA Wghse. 240 V. Cond.

### STEAM ENGINE SETS

500 KVA G.E. 240/480 V.—Bates
255 KVA G.E. 240 V. Hamilton Corliss
200 KW G.E. 125 V.—Erie Ball 4 V.
200 KW G.E. 125 Skinner Uniflow
150 KW G.E. 240 V.—Erie Ball 4 V.
150 KVA G.E. 240 V.—Skinner s. v.
125 KW G.E. 240 V.—Erie Ball 4 V.
100 KW G.E. 240 V.—Erie Ball 4 V.
100 KW G.E. 125 V.—Erie Ball 4 V.
20 x 21 Skinner Uniflow, belted, 175 lbs. (15 to 25 lbs. b.p.)
18 x 20 Ames Uniflow; dir. con.



### • BLEEDER TURBINE UNIT

**625 KVA Allis Chalmers-Elliott 3 ph. 60 cy. 240/480 v.; automatic bleeder; with jet or surface condenser**

### TRANSFORMERS

687 KVA (2) Maloney 13800—460 V.
500 KVA (3) Al. Chal. 33000—440 V.
250 KVA (3) Packard 22000—2300 V.
250 KVA (2) G.E. 6600-2300 V.
150 KVA (2) G.E. 2300/4000-115/230 V.
100 KVA (3) Al. Chal. 22000—440 V.
100 KVA (6) G.E. 13200—2300 V.

### FIRE PUMPS (Motor Driven)

1600 GPM Al. Chal. 216' head; dir. con.
1500 GPM Worthington 216' head; dir. con.
850 GPM Al. Chal. 243' head; dir. con.
8" Hill 2 stage; dir. con.

### STOKER

1—Illinois Chain Grate for 1300 HP
2—Illinois Chain Grate for 350 hp.
2—Taylor Underfeed for 550 hp.
1—Combustion Engrg. Underfeed for 250 hp.

### COAL PULVERIZERS

8000 lbs. Fuller Bonnett; Motor Driven
6000 lbs. Whiting; Motor driven
2—4500 lbs. Erie City; Motor Driven

### BOILERS (ASME)

500 HP Badenhausen, 350 lbs.
749 HP (4) Edgemoor 200 lbs.
500 HP Murray (Heine) 180 lbs.
471 HP Erie City Vert. 200 lbs.
418 HP Sterling 200 lbs.
300 HP Erie City (Heine) 160 lbs.
298 HP (3) Sterling 200 lbs.

### SURFACE CONDENSERS

3850 Sq. Ft. Worthington
2400 Sq. Ft. Al. Chal.
800 Sq. Ft. Wheeler
625 Sq. Ft. Wheeler

### DIESEL ENGINE SETS

900 KVA G.E. 3 ph.—McIntosh-Sey.
375 KVA Wghse. 3 ph.—Busch-Sulzer
312 KVA Burke 3 ph.—Anderson
219 KVA G.E. 3 ph.—Worthington
200 KVA G.E. 3 ph.—Busch-Sulzer
40 KVA Fairbanks Morse 3 ph., 60 cy.

# MOTORS • GENERATORS • TRANSFORMERS

## Prices on Application

**3 PHASE, 60 CYCLE, 220/440 V.**

| HP | Make | RPM | Type | Frame |
|---|---|---|---|---|
| 5 | West. | 1200 | CCL | 2 phase |
| 5 | American | 600 | totally enc. | ball bearing |
| 7½ | Gen. Elect. | 1800 | KT | 944 |
| 7½ | Gen. Elect. | 1800 | KQ | 944 2 phase |
| 10 | Fairbanks Morse | 900 | KBY | |
| 10 | Crocker Wheeler | 900 | Nema | 365 |
| 10 | Burke | 1800 | | |
| 15 | Reliance | 1200 | | 2 phase |
| 15 | Howell | 900 | | 2 phase |
| 20 | Gen. Elect. | 1800 | KQ501 | 2 phase |
| 20 | Gen. Elect. | 565 | I | Form K |
| 25 | Gen. Elect. | 1740 | KQ312 | 2 phase |
| 25 | Armor | 1200 | ball bearing | 2 phase |
| 25 | Gen. Elect. | 1800 | KT | 312 |
| 30 | Gen. Elect. | 3600 | KT | 513 |
| 30 | Armor | 695 | ball bearing | 2 phase |
| 50 | West. | 1200 | MS | |
| 50 | Fairbanks Morse | 1800 | ball bearing | |
| 50 | Fairbanks Morse | 1800 | ball bearing | |
| 50 | West. | 1800 | CS | |
| 60 | Gen. Elect. | 1800 | I | form K |
| 75 | Gen. Elect. | 1800 | I | form K |
| 75 | Gen. Elect. | 900 | KT | 552 |
| 100 | Gen. Elect. | 1800 | I | form K |
| 100 | West. | 1800 | CS | |
| 150 | Gen. Elect. | 1200 | I | form K |
| 150 | Gen. Elect. | 1200 | I | form K |

### MOTOR GENERATOR SETS

1—100 KW Ridgeway sets 250 v. DC. 1200 RPM direct connected to 150 HP. Ridgeway synchronous motors, 3/2200/60/1200 complete with panels.

1—100 KW. Crocker Wheeler 250 v. DC 500 RPM direct connected to 150 HP General Electric Motor 3 HP 25 cycle 2200 volts 500 RPM, complete.

1—75 KW Ridgeway 140 v. DC 1200 RPM direct connected to 120 HP Ridgeway synchronous motor 3/2200/60/1200 RPM. Complete.

1—35 KW Westinghouse Generator 125 volt DC 1450 RPM direct connected to 53 HP West. CS motor 3 ph. 25 cy. 220 v. 1450 RPM. Complete.

### 25 Rotary Converter

1—150 Allis Chalmers Rotary 250 Volts D.C. 500 R.P.M. complete with panels. Transformer 25 cycle, 2300 volts.

### SLIPRING MOTORS

**60 CYCLE, 3 PHASE, 220/440 VOLTS**

| HP | Make | Speed | Type | Frame |
|---|---|---|---|---|
| 10 | Gen. Elect. | 1800 | MT | 303 |
| 15 | Gen. Elect. | 1800 | I | form M |
| 20 | Gen. Elect. | 545 | MT | 332 |
| 20 | Westinghouse | 575 | CW | 648A |
| 20 | Westinghouse | 575 | CW | ball bearing |
| 25 | Westinghouse | 690 | CW | |
| 30 | Gen. Elect. | 1800 | MT | 327 |
| 30 | Gen. Elect. | 1800 | I | form M |
| 40 | Westinghouse | 690 | CW | 748 |
| 40 | Westinghouse | 690 | CW | 748A |
| 40 | Westinghouse | 690 | CW | 748A |
| 40 | Westinghouse | 690 | CW | 748A |
| 50 | Westinghouse | 900 | CW | |
| 60 | Westinghouse | 720 | CW | 2200 volt |
| 75 | Westinghouse | 1800 | CW | |
| 300 | Gen. Elect. | 1200 | I | form M |
| 500 | Westinghouse | 600 | CW | |

### TRANSFORMERS

| Amt. | Kva. | Make | Cycle | Voltage |
|---|---|---|---|---|
| 21 | 25 | G.E. | 25 | 2300/230/460 |
| 6 | 40 | G.E. | 5 | 2300/230/460 |
| 6 | 30 | G.E. | 25 | 2300/115/230 |
| 24 | 50 | G.E. | 25 | 2300/230/460 |
| 3 | 50 | Packard | 25 | 6900/230/460 |
| 18 | 50 | G.E. | 60 | 4160/4600/230/460 |
| 3 | 75 | 60 | 60 | 4160/4600/230/460 |
| 18 | 100 | G.E. | 60 | 4160/4600/230/460 |
| 3 | 100 | Kuhlman | 25 | 2300/230/460 |
| 3 | 200 | G.E. | 60 | 2300/230/460 |
| 3 | 200 | G.E. | 60 | 6900/230/460 |
| 3 | 200 | Kuhlman | 60 | 4160/4600/230/460 |
| 3 | 500 | Pitts. | 25 | 11500/220 |
| 3 | 1000 | Pitts. | 60 | 2300/4600/230/460 |

## Prices on Application

**3 PHASE, 25 CYCLE, 220/440 VOLTS**

| HP | Make | RPM | Type | Frame |
|---|---|---|---|---|
| 50 | Gen. Elect. | 750 | I | formK |
| 50 | Westinghouse | 750 | CS | |
| 75 | Gen. Elect. | 750 | KT | 357 |
| 75 | Gen. Elect. | 750 | I | form K |
| 100 | Gen. Elect. | 750 | I | form K |
| 100 | Gen. Elect. | 300 | 117 | form K |
| 150 | Gen. Elect. | 750 | I | form K |
| 150 | Gen. Elect. | 750 | I | form K |
| 200 | Westinghouse | 460 | CS | 2200 volt |
| 200 | Gen. Elect. | 750 | I | form K |
| 225 | Elec. Machinery | 500 | 2200 | volt synchronous |
| 1150 | Gen. Elect. | 375 | 2300 | volt synchronous |
| 200 | Westinghouse | 235 | CW | slipring |

### SPECIAL MOTORS

1100 H.P. General Electric Synchronous Motor, 3 ph., 25 cy., 11,500/6600/2200 V., 375 RPM.

500 H.P. Allis-Chalmers, 3 ph., 25 cy., 440 V., 490 RPM. Complete.

300 H.P. G.E. Slipring, 25 cy., 3 ph., 2200 V., 500 RPM, 3 bearing; complete with controls.

225 H.P. Electric Mchy. Co. Synchronous, 3 ph., 25 cy., 2200 V., 500 RPM, with controls.

1—100 H.P. G.E. Synch. Motors, 3 ph., 25 cy., 220/440 V., with control equipment.

1—20 H.P. Gen. Elec. Motor 230 v. DC. Type CD83 1750 RPM.

1—75 HP. Westinghouse Motor Type SK, 230 v. DC 475/950 RPM variable speed.

### FREQUENCY CHANGERS

2—1250 KVA Gen. Elec. Synchronous—motor 3/25/2300 750 RPM. direct connected to Generator 3/62½/440 V. Complete with exciters and panels.

1—200 KW General Electric 3 ph., 60 cy., 2300 V. direct connected to 290 HP. Gen. Elec. Synchronous Motor, 3 ph., 25 cy., 440 volt, 750 RPM. Complete with panels.

1—120 KVA Gen. Elec. Induction Frequency Changer, 440 V., 3 Phase, 62½ Cycle. Driving motor 100 H.P., 3/25/440 RPM. Complete.

94 KVA Westinghouse Synchronous Set Generator, 63½ cy., 230 v., 750 RPM with panels. Motor 112 HP. 3/25/2300/750 Synchronous with starting equipment.

# ERIE ELECTRIC CO., INC.

**124 CHURCH ST. BUFFALO, N. Y. CL. 4758**

## FOR SALE

**SQUIRREL CAGE**

4—200 HP 3/60/2200 v. 347 RPM motors, used as standby.

**TURBO SET**

600 KW Allis Chal. 3/60/600 v. condensing, 150# int. press.

**TRANSFORMERS**

3—1000 KVA 1 ph. 60 cy. 2300 v. to 220 v.

**SLIPRING**

400 HP GE MT-412 3/60/2300 450 RPM
300 HP GE I-M 3/60/2300 514 RPM

**VARIABLE DC MOTORS**

2—700 HP GE MCF 600 v DC 125/525 RPM

**CHICAGO ELECTRIC CO.**

1320 W. 20 Str. Chicago, Ill.

## Motor Generator Sets—Synchronous Motors, etc.

**MOTOR GENERATOR SETS & ROTARIES**
**3 phase, 60 cycle, A.C.**

2—Allis-Chalmers 300 KW 250 Volt M-G sets, 2300 V. A.C.
1—Ridgway 100 KW 250 V. M-G set 2300 A.C.

**VERTICAL MOTORS**

1—G. E. 50 HP 1200 RPM 3 ph 60 cy 220 V.
1—Reliance Fan-cooled 25 HP 1750 RPM 220/440 V.

**SYNCHRONOUS MOTORS**
**3 phase, 60 cycle, A.C.**

1—Burke 300 HP 900 RPM 440/220 Volt
1—Ideal 50 HP 600 RPM 2300 Volt

**SLIP RING MOTORS 3 phase, 60 cycle**

Allis-Chalmers 250 HP 600 RPM 440 Volt
G. E. 60 HP 600 RPM 440 Volt
G. E. 62½ HP 1150 RPM 440/220 Volt

**SQUIRREL CAGE MOTORS**
**3 phase, 60 cycle, 220/1440 Volts**

1—150 HP 1750 RPM Allis-Chalmers
2—100 HP 550 RPM Westinghouse MS
1— 75 HP 575 RPM Westinghouse CS—368-A
1— 75 HP 600 RPM Fairbanks-Morse
1— 75 HP 720 RPM Lincoln I-P
1— 65 HP 860 RPM Allis-Chalmers
1— 50 HP 575 RPM Westinghouse CS—752-C
1— 50 HP 690 RPM Westinghouse CS—758
1— 50 HP 875 RPM Westinghouse CS
1— 50 HP 865 RPM Ideal
1— 50 HP 1200 RPM Northwestern H-50
1— 50 HP 1750 RPM Westinghouse CS—53-C
1— 40 HP 1200 RPM Northwestern H-50
5— 20 HP 870 RPM West. T.E.F.C. CS—W-405
2— 20 HP 870 RPM West. CS—W-405
2— 15 HP 860 RPM Allis-Chalmers

**ALTERNATOR SPECIAL, Allis-Chalmers, 125 KVA, 277 RPM, 3 phase, 60 cycle**

**The Electric Motor & Repair Co., Cuyahoga Falls, O.**

## SYNCHRONOUS CONVERTERS

500 KW AL-CH. 250 D.C. 2300/4000 A.C. 1200 RPM
500 KW WEST. 250 D.C. 2300/4000 A.C. 1200 RPM
300 KW G.E. 600 D.C. 2300/4000 A.C. 1200 RPM
200 KW AL-CH. 250 D.C. 2300/4000 A.C. 1200 RPM
150 KW G.E. 250 D.C. 2300/4000 A.C. 1200 RPM
150 KW WEST. 250 D.C. 2300/4000 A.C. 1200 RPM

## MOTOR GENERATORS

350 KW G.E. SYN. 250 V. 2300/4000 A.C. 1200 RPM
300 KW G.E. SYN. 250 V. 2300/4000 A.C. 1200 RPM
200 KW G.E. SYN. 250 V. 2300/4000 A.C. 1200 RPM
200 KW G.E. IND. 600 V. 2300 A.C. 1200 RPM
200 KW R.W. SYN. 250 V. 2300/4000 A.C. 900 RPM

## TURBO GENERATOR SET

300 KW GENERAL ELECTRIC-CURTIS, 250 V. D.C. Turbine. Non-Condensing, 100# Steam Pressure. 3600 RPM. Gen. ELEC. 300 KW MPC Generator and D.C. Panel.

*Each unit listed above is owned by us and is Available now for immediate purchase.*

**WALLACE E. KIRK CO.**
Incorporated
**502 Grant Building Pittsburgh, Pa.**

## DIESEL ENGINES AND GENERATOR SETS

| | | |
|---|---|---|
| 1—20 HP Fairbanks Morse | 1— 80 HP Atlas Imperial* | 2—200 HP Buda* |
| 1—25 HP Fairbanks Morse | 1—100 HP Fairbanks Morse | 1—210 HP Superior |
| 1—50 HP Cummins* | 1—112½ HP Buckeye | 1—360 HP Fairbanks Morse |
| 1—63 HP Buda* | 2—120 HP Hercules | 1—440 HP Ingersoll Rand |

*Fitted With Clutch and Power Take-Off

**A. G. SCHOONMAKER COMPANY**
50 Church Street Phone—WOrth 2-0455-6-7 New York, N. Y.

## Priced For Immediate Sale!

1—520 HP Hamilton Corliss Engine Generator Set, direct connected to G.E. 360 KW Generator, 3/60/480 volt, 150 RPM, with G.E. Exciter and Westinghouse 3 panel switchboard. PRICE $1500.00.
At Location, SALT LAKE CITY, UTAH

*Several Boilers, from 100 to 500 HP, with and without Stokers at other locations.*

**BRILL Equipment Co**
183 VARICK STREET NEW YORK

### AC MOTORS

40 HP. 1800 RPM. 3/60/2300, Gen. Elec. KT
40 HP. 1200 RPM. 3/60/2300, Gen. Elec. MT
75 HP. 720 RPM. 3/60/440, Gen. Elec. IK

### AC GENERATORS

80 KW. 900 RPM. 3/60/240, Fair. Morse
150 KW. 600 RPM. 3/60/220, Gen. Elec. ATB
150 KW. 225 RPM. 3/60/2300, Ft. Wayne
200 KW. 720 RPM. 3/60/240, Gen. Elec. ATB

### DC GENERATORS

35 KW. 115 Volt, 720 RPM. Allis Chalmers
75 KW. 250 Volt, 500 RPM. Northern 2 brg

### PLATING GENERATOR

2500 Amp. 6 Volt, 900 RPM. Zucker Leavit & Loeb

### M-G SET

100 KVA. 3/60/240 V. AC Fair. Morse generator dir. con. 125 HP. 525 Volt DC Fair. Morse motor

### HYDRAULIC PRESS

190 Ton Capacity, 6' dia., 10' long, horizontal

**ROCKFORD ELECTRIC EQUIPMENT CO.**
721 South Wyman St. Rockford, Illinois

# A FEW CHOICE UNITS
## *NOW RELEASED*

### TURBO ALTERNATORS 60 cycle

(150-200#)

500 KW 2300 V Surf. Condenser in Texas G.E. (1914)

500 KW 2300 V. Surf. Condenser in Arkansas Allis (1911)

750 KW 575 V. Non Cond. 5# B.P. in New York W. H. (1909)

750 KW 2300 V. SURF CONDENSER IN ARKANSAS. G. E. (1922)

750 KW 188 V. Jet Condenser in Pennsylvania G. E. (1917)

2000 KW 480 V. Jet Condenser NEW GUARANTEE Allis (1926)

350# I.S.P.

2500 KW 2300 V. Surf. Condenser very fine unit

### BOILERS

| | | | | |
|---|---|---|---|---|
| 2—100 HP | 200# | Code (1925) | Sectional Hdr. | Stokers |
| 1—250 HP | 160# | Code | Stirling | Stokers-Auxlrs. |
| 3—500 HP | 150# | | Sickes Vert. | In Kansas |
| 2—400 HP | 200# | Precode | Sectional Hdr. | Stokers-Auxlrs. |
| 1—700 HP | 200# | Code (1922) | Erie City | Ins. Co. Approved |
| 2—270 HP | 180# | Precode | Sectional Hdr. | Ins. Co. Approved Grates |
| 2—300 HP | 175# | Precode | Heine | Ins. Co. Approved |
| 1—300 HP | 200# | Precode | Sectional Hdr. | |
| 1—600 HP | 150# | Code | Connelly | Ins. Co. Approved |

### MOTORS

*Synchronous 440 V. 164 RPM (1918)*

1—620 HP at units PF 500 HP at 80%. Switchboard, etc. Exciter (belted) 2 bearing with pedestal & floor plate

*Slipring 440 V. 350 RPM*

1—800 HP and 1—600 HP

*Induction 550 V. 690 RPM*

1—100 HP Adjustable base
1—150 HP Double end shaft

## PAUL STEWART & COMPANY

MAIN 3427 MAIN 3428 UNION TRUST BLDG.

CINCINNATI, O.

### BOILERS

1—2100 HP **Badenhausen** 354# pressure with pulverizers and all auxiliaries.
1—1000 HP **Badenhausen Riley** 200# pressure with pulverizer.
5—512 HP **Sterling** Class S-26 200# pressure.
1—600 HP **Connelly** 200# pressure.
2—492 HP **Sterling Boilers,** 160# pressure stokers.
1—453 HP **Sterling Boiler** chain grate stoker, 160# pressure.
8—400 HP **Sterling** 200# pressure with pulverized fuel and all auxiliaries.
1—394 HP **Sterling Boiler** chain grate stoker, 160# pressure.
2—250 HP **Sterling Boilers,** 160# pressure equipped with gas burners and controls.
2—253 HP **Sterling Boilers,** 160# pressure with oil burners.
2—250 HP **Wicks Vertical Boilers** 160# pressure with pulverizers.
2—500 HP **Edge Moor Boilers** 200# pressure.
4—500 HP **Voigt Water Tube Boilers** 175# pressure with chain grate stokers and all auxiliaries.
1—440 HP **B & W Sectional Header Boiler** 150# pressure, underfeed stoker.
1—522 HP **Sterling Boiler** 200# pressure with Firite Stoker.
2—484 HP **Springfield Boilers** 200# pressure.
1—484 HP **Springfield Boiler,** 250# pressure oil burners.
1—520 HP **B&W Sectional Header Boiler,** 200# pressure.
1—**Complete Power Plant** consisting of 2—309 HP **Heine Marine Boilers** 225# pressure and 2 General Electric Turbines with all auxiliaries.
1—150 HP **Scotch Marine** 150# pressure.
5—150 HP **Erie City HRT Boilers,** 125# pressure.
1—300 HP **Locomotive Boiler** 150# pressure with all trimmings.
1—150,000# **Badenhausen Boiler** 350# pressure with pulverizer, all auxiliaries.
3—250 HP **Erie City** vertical boilers with pulverizers.
1—400 HP **Connelly Boiler** 160# pressure with new tubes and auxiliaries.
2—84" x 20' **HRT Boilers,** 150# pressure all auxiliaries.
6—443 HP **B&W Sectional Header Boilers,** 200# pressure.
2—150 HP **Brownell Boilers,** 125# pressure, rebuilt and guaranteed.
56—50 HP **Vertical Boilers** 150# pressure all auxiliaries.

### TURBINES

1—5000 KW **Westinghouse** 1800 RPM 3-60-2300 volts Surface Condenser all auxiliaries.
1—3200 KW **Allis-Chalmers Condensing Turbine** with auxiliaries.
1—2500 KW **General Electric Condensing Turbine** with auxiliaries.
1—2500 KW **General Electric Turbine** 400# pressure, Surface Condenser.
1—1000 KW **Westinghouse non-condensing turbine** 350# pressure 16# back pres.
1—937 KVA **Allis-Chalmers Turbine.**
1—625 KVA **General Electric Turbine** with jet condenser.
1—2000 KW **Westinghouse Turbine** with Surface Condenser and auxiliaries 3-60-440 volts.
1—300 HP **Kerr Non-condensing** 3600 RPM Turbine.
1—250 KVA **Waite Turbine** either condensing or non-condensing.
1—250 KVA **General Electric non-condensing Turbine.**
1—125 KW **General Electric non-condensing turbine.**
4—250 HP **HRT Boilers** 150# pressure.

### ENGINE GENERATOR SETS

1—200 KVA **Harrisburg Uniflow Engine Generator Set.**
1—750 KVA **Rice & Sargent** 3-60-600 volt engine generator.
1—480 KW **Rice & Sargent** 3-60-550 volt engine.
1—375 KVA **Chuse Corliss eng. generator.**
1—375 KVA **Chuse vertical Uniflow engine.**
2—312 KVA **Skinner Uniflow engines.**
1—166 KVA **Ames Uniflow engine generator set.**
2—125 KVA **Skinner Counterflow engine generator sets.**

### DIESEL ENGINES

1—300 KVA **Fairbanks-Morse** Full Diesel engine generator set.
1—450 HP **Cooper-Bessemer** Tex rope driven to 300 KW AC **Generator.**
1—**Complete Diesel Plant** consisting of 1—250 KVA **Buckeye Full Diesel,** 1—225 KVA **Atlas Full Diesel,** 1—94 KVA **Caterpillar Diesel.**
4—500 HP **Busch-Sulzer** 6 cylinder oil engines used only 300 hours.

### ENGINE GENERATOR SETS

1—625 KVA **Nordberg** Uniflow engine.
1—1000 KVA **Skinner** Uniflow engine.
1—375 KVA **Skinner** Uniflow engine.

### MISCELLANEOUS

2—400 GPM **Centrifugal Boiler Feed Pumps.**
1—2000 HP **Cochrane Metering Feed Water Heater.**
1—10' x 15'- **Illinois Forced Draft Chain Grate Stoker.**
1—#8 **Fuller Bonot Pulverizer.**
2—Type AA-6 10 retort **Taylor Underfeed Stokers.**
2—6 Retort **Taylor** Underfeed **Stokers** with fans.
2—6' x 6' **Jones underfeed stokers,** side dump.
3—72 x 18' **HRT Boilers** 150# pressure with Detroit underfeed **stokers,** complete plant.

SEE Fletcher FIRST!

## FLETCHER SALES CO.

835 Security Trust Bldg. INDIANAPOLIS, IND.

# SEARCHLIGHT SECTION

### SLIP RING MOTORS, 3 PH., 60-CY.

| HP | Volts | Make | Speed |
|---|---|---|---|
| 700 | 2200 | G.E. | 900 |
| 400 (2) | 440 | Whse. | 514 |
| 350 | 220-440 | G.E. | 1800 |
| 350 | 2200 | G.E. | 600 |
| 300 | 2300-4000 | G.E. | 1200 |
| 250 | 440-550 | G.E. | 600 |
| 200 | 2200-550 | G.E. | 1800 |
| 200 | 2200-440 | G.E. | 600 |
| 150 | 440-220 | G.E. | 1800 |
| 150 | 2200 | G.E. | 900 |
| 150 | 2200-440 | Whse. | 1800 |
| 150 | 550-2200 | G.E. | 1800 |
| 125 | 440-220 | G.E. | 600 |
| 100 | 550-2200 | G.E. | 720 |
| 100 | 440-220 | G.E. | 1800 |
| 100 | 220-440 | G.E. | 720 |
| 100 | 220-440 | G.E. | 900 |
| 75 | 220-440 | G.E. | 600 |

### SYNCHRONOUS MOTORS, 3-PH., 60-CY.

| | | | | |
|---|---|---|---|---|
| 00 | 2200 | | Whse. | 900 |
| 00 | 440-220 | | Whse. | 276 |
| *00 | 440-220 | | G.E. | 900 |
| *00 | 2300-440-220 | | G.E. | 600 |
| *00 | 2300-4000 | | G.E. | 1200 |
| | 150 | 2200 | G.E. | 1800 |
| | 100 | 440-220 | G.E. | 1200 |

### TRANSFORMERS—60 CYCLE

2—667 kva., G.E., 2300/4000-460/480 Volts.
3—667 kva., Whse. 22000-2300.
3—500 kva., Whse. 22000-2300.
3—350 kva., G.E., type H-KD 13200-2200.
3—333 kva., G.E., type H-KDD 2400-460/230.
3—250 kva., Whse. 13,800-460.
3—200 kva., G.E., type H 10000-600.
3—200 kva., G.E., H-KD 6600-2300/4000Y., 25 cy.
3—175 kva., G.E. 4000-480.
3—150 kva., G.E., type H-KDD 13200-2300.
3—150 kva., Al. Chal., type OISC 10400-2400.
1—100 kva., Pittsburgh, type OISC 2400-240-120.
3—100 kva., G.E., type H 2400-240/480.
3—100 kva., G.E., type H-KDD, 6900/11950Y-230/115.
3—100 kva., Whse. 22,000-2300.
2—75 kva., G.E., type HK, 2300-230/115.
3—50 kva., Moloney, 2300-230/115.
6—50 kva., Whse. type SK, 13800-240/120.
2—50 kva. Whse. 22,000-2300.

### A.C. GENERATORS

1—500 kva., 900 r.p.m., 2209 V. Whse. Condenser.
1—300 kva., 900 r.p.m., 240/480 V., G.E.
1—225 kva., 600 r.p.m., 2200-240-V., G.E.
1—187 kva., 900 r.p.m., 2200-550-V., Westghse.

### SQUIRREL CAGE MOTORS

| HP | Volts | Make | Type | Speed |
|---|---|---|---|---|
| 500 | 440/220 | G.E. | IK | 1200 |
| 500 | 440/220 | G.E. | IK | 900 |
| 400 | 2200 | Whse. | C.S. | 1800 |
| 50 | 2200 | G.E. | IE-K | 1800 |
| 250 | 2200 | G.E. | I-K | 600 |
| 200 | 220/440 | G.E. | IK | 720 |
| 150 | 2200 | Allis. Ch. | AN | 450 |
| 100 | 2200 | G.E. | IK | 600 |
| 100 | 2200 | G.E. | IE-K | 1800 |
| 100 | 550 | G.E. | KT | 900 |
| 100 | 220/440 | G.E. | KT | 720 |
| 75 | 2200 | G.E. | KT | 900 |
| 75 | 2300 | G.E. | IE-K | 1800 |
| 50 | 220/440 | G.E. | K | 1800 |

### MOTOR GENERATOR SETS

2—200 KW 125 V. 900 RPM Whse. Con. to 300 HP 2200 V. 3 Ph. 60 Cy. Ind. Motor. Also
1—100 KW 125 V. 900 Rpm GE Con. to 150 HP 200 V. Ph. 60 Cy. Ind. Motor.
1—75 K.W., 250 V., 1800 R.P.M., Cr. Wh., Type CCD con. to 100 H.P., 2200 V., 3 ph., 60 cy.
1—50 K.W., 250 V., 720 R.P.M. Whse., Type SK con. to 75 H.P. 220/440 V., 3 ph., 60 cy. Sq.c.

**STEPHEN HALL & CO.**

HARRY J. RICE PRES.

458 SEVENTH ST. HOBOKEN, N. J.

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### STEAM PUMPING ENGINES

1—Snow 6 mgd. C&FW Cr. Com. Opp. Type Cond. 20-40x14½x36, with waterwork type cond.
1—Allis-Chal. 4 mgd. cr. com. cond. Size 12x28x13x24. Fine cond.
Worth. Dup. Pump size 16x12x12, cap. 1100 gpm. heavy water wks. type.

### PUMP VALVES

Birch Valves for reciprocating pumps.

### LARGE GATE VALVES

1—20" Rensselaer #13 Iron Body Bronze Mounted Hub End Gate Valve with 16" Iron Brass Lined Hydl. Cyl. with indicating Rod & Eyebolt, 100# max. pres. on gates, 50# min. Cyl. Operating press.
1—20" Crane 125# Flanged Hand Wheel operating Gate Valve.

### SURFACE CONDENSER

1—10 AD 4 pass 210 ft. Foster Wheeler over Comb. Air Circulating and Tail Pump.

**BIRCH MANUFACTURING COMPANY**

1523 Sedgwick St. Chicago, Ill.

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**1—3000 KW. TURBO 60 CY. 3 PH. 480 V. WITH COND.**
**1—4000 KW. TURBO 4150 V. 60 CY. 3 PH. WITH COND.**
**7500 KW. 5000 V. 60 CY. 3 PH. TURBO WITH COND.**
**Heat Exchanger 606 tubes 1¼ x 9' 6" long.**
**1500 CFM 2 STAGE AIR COMP. 275 HP. SYN. MOTOR DRIVE.**
**3—100 KW. 125-250 V. DC G.E. TURBOS Non-Cond.**
**1—New Fan 66750 CFM 2" to 6" Press.**
**4—Cent. Pumps 4166 GPM, 162' Head with AC Motors.**
**1—36000 GPM 27' head Cent. pump.**
**Lot extra heavy gate valves, back pressure valve, etc.**
**Traveling Crane 75 ton Case, 64' span, 3 Motors.**
**750 KW. and 110 KW. AC Hydro Elec. Plants (also others).**
**2—150 HP. HRT BOILERS and Stack.**

**ROSS POWER EQUIPMENT CO., Indianapolis, Ind.**

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### FOR SALE

1—180 H.P. Allis-Chalmers, Horiz. 2-Cylinder 16" x 24" Full Diesel Direct Connected to 156.5 Kva. 3/60/2300-Volt Generator.
1—280 H.P. De La Vergne, Horiz. 2-Cylinder 20" x 34" Full Diesel Solid Injection, Direct Connected to 250 Kva G-E Generator 3/60/2300 V. Both have Exciters, and Switch Boards

*All Ready for shipment—Kansas City. Write*

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Reconditioned Motors, Generators, Control Equipment, etc.

*Send for 32 page stock list.*

Electric Apparatus Repair Company

*Specialists on Rebuilding Motors, Generators and Controls*

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### DIESEL ENGINES

Large selection—All sizes and types. Generator units, marine engines, gasoline engines, auxiliaries—also boilers, steam engines, turbo generators.

*Complete information on request.*

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50 Church St. Phone—Worth 2-0455 New York, N.Y.

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# BOILERS

***NEW and USED!***

*All makes & sizes for prompt shipment*

2—500 H.P. Stirling 160#
1—312 H.P. Stirling 160#
3—300 H.P. B & W 150#
1—200 H.P. Heine 160#
1—516 H.P. Stirling 200#

*We want to buy 50 HRT boilers from 100 to 200 H.P. 125# pressure or better.*

**J. F. DAVIS CO.**

122 S. Michigan Ave. CHICAGO

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### TURBO-GENERATOR SETS

1—500 KW Allis-Chalmers .8 p.f. 3 phase, 60 cycle, 240 volts, 1504 amps. 3600 RPM generator with
1—Allis-Chalmers-Parsons turbine, for 150# steam pressure, 100-deg. superheat, 20# absolute back pressure, with
1—Exciter, on same shaft as turbine and generator;
1—300 KW .8 p.f. Allis-Chalmers, a.c. generator, 240 volts, 3 phase, 60 cycle, 3600 RPM, 900 amps. with
1—300 KW Allis-Chalmers-Parsons turbine, for 150# steam pressure, 100-deg. superheat, 20% absolute back pressure, with
1—Westinghouse switchboard equipment, consisting of
1—Exciter panel,
1—Synchroscope,
1—Westinghouse voltage regulator, type ABS on slate panel,

Can be seen in operation. Inspection invited.

**CHICAGO ELECTRIC COMPANY**

1320 W. 20th St. Chicago, Ill.

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### NEED ANYTHING?

**180 HP Fairbanks "VA" Diesel Engine.**
**Clutch Pulley for 360 HP Diesel Engine.**
**2—250 HP Heine Watertube Boilers 150#.**
**100 HP 100# Kewanee #419 Firebox Boiler.**
**150 & 250 HP H.R.T. Boilers. Also Stokers.**
**542 ft. 2 stage Belted Air Compressor.**
**48" Steel Stack, 56, 80, 137 foot.**
**257 rpm Generators. 75, 125, 200 KVA.**
**2—250/500 HP "Firite" 8 x 7' Stokers.**

**MISSISSIPPI VALLEY EQUIPMENT CO.**

507 Locust St. St. Louis, Mo.

*Have you anything for Sale?*

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### 300 KW ROTARY CONVERTER

1—300 KW Westinghouse Rotary Converter, 600 volts, D. C., 6 phase, 60 cycle, pedestal bearings, 1200 RPM.

### SYNCHRONOUS MOTOR

1—250 HP Westinghouse Type HR, for 3/60/2200 volts, 277 RPM, Engine Type

### DEEP WELL PUMPS

2—600 GPM, 116 ft. Kingsford Centrifugal Pumps driven by 40 HP General Electric Type CD, 230 V. DC motors

### HOIST

1—50 HP Lidgerwood Double Drum Hoist, 24x24" drums side by side with or without motor, AC or DC.

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## ELECTRIC EQUIPMENT
FOR
## INDUSTRY

LET US KNOW YOUR REQUIREMENTS

REBUILT & GUARANTEED STOCK
MOTORS, D.C. & A.C.
TRANSFORMERS
MOTOR GENERATOR SETS
ROTARY CONVERTERS
SWITCHBOARDS BUILT TO ORDER

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### 100 KW ROTARY CONVERTER

1—100 KW General Electric Rotary Converter, Type TCC, 250 volts D.C., 3 phase, 60 cycles 2300 volts A.C.

### CRUSHERS

2—36x48" Link Belt Double Roll Crushers for 1½" to 3" size.

### SYNCHRONOUS MOTORS

1—250 HP Westinghouse Type HR, for 3/60/2200 volts, 240 RPM Engine Type.
2—150 HP 80% P.F. Westinghouse Type G for 3/60/220/440 volts, 1200 RPM, direct conn. exciters.

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FREQUENCY CHANGERS—TURBO GENERATORS—AC & DC MANUAL MAGNETIC CONTROL—CENTRIFUGAL PUMPS—AC & DC SWITCHBOARDS

*FOR DETAILS, WRITE* **JOHN D. CRAWBUCK CO.** *714-15 EMPIRE BLDG. PITSSBURGH, PENNA.*

# POWER PLANT EQUIPMENT

### TURBO GENERATORS

5000 KW GE Cond. 2300 volts
2500 KW GE Cond. 2300 volts
2000 KW GE Cond. 600 volts
600 KW GE Cond, 600 volts
500 KW GE Extract, 600 volts
200 KW GE Cond. 2300 volts
150 KW West Non-Cond. 600 volts

### TURBINES ONLY

230 HP Terry—150 lbs.
210 HP Terry—250 lbs.
175 HP GE—110 lbs.

### AIR COMPRESSORS

5600 CuFt IR 35# Motor Driven
782 CuFt IR 55# Belted
600 CuFt IR 500# Steam Driven
275 CuFt IR 110# Steam Driven
146 CuFt IR 1200# Belted
136 CuFt Chic. 110# Belted

### CENTRIFUGAL COMPRESSOR

10,000 CuFt—35# Turbine Driven
7,000 CuFt 21.7# Turbine Driven

### BOILERS

4—1000 HP Heine—250#—Oil
1—750 HP Heine—200# Stoker
5—318 HP Manning Type—190#
2—303 HP Sterling—160#
2—255 HP H.R.T. 150# Stoker
2—235 HP H.R.T. 175# Grates
2—200 HP H.R.T. 100# Grates
2—100 HP H.R.T. 125# Grates
1—400 HP Sterling 160# Stoker

### ENGINE—GENERATORS

1000 KVA Unaflow—440 volts
375 KVA Unaflow—440 volts

*Also transformers, engines and cranes*

*Send us your inquiries*

**A. LEE ELLIS CO., U. S. Mchy. Bldg., Boston, Mass.**

The Buyer Must Be Satisfied—Always

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FOR SALE

## DIESEL ELECTRIC GENERATOR SET

**3 phase, 60 cycles, 220 volts, 600 R.P.M**

**Consisting of: 60 K. W. BURKE Generator, directly connected to "Standard" 6 cylinder heavy duty Diesel Engine. Complete with exciter, main panel board, and automatic voltage control.**

**Ask for Details—*A BARGAIN FOR SOMEONE***

**MOREY MACHINERY CO., INC.**
**410 Broome Street New York, N.Y.**

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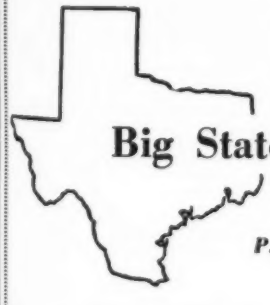

# BOILERS

## Big State Boiler & Engineering Co.

*TELEPHONE : 3-4818*
*P. O. BOX 1974 • FORT WORTH, TEXAS*

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## Motor Generator Sets

1—220 H.P. **Westinghouse** 400 volts, 25 cycle, 3 ph. 269 amps., 490 RPM, 2 bearing connected to 150 KW Westinghouse Gen., 145 volts, 1200 amps., 490 RPM. Mounted on common base.
2—200 H.P. **Westinghouse** 6600 volts, type C, 3 phase, 485 RPM, 60 cycle, connected to 2 bearing 150 KW Westinghouse Gen. 1200 amps., 125 volts, 485 RPM. Mounted on common base.
1—70 H.P. **General Electric** type MP, Class 4-70, 125 volts, 460 amps., 600 RPM, connected to 3 bearing G.E. Gen. type MP, 1600 amps., 600 RPM, full load voltage 25 volts. Mounted on common base.

**ALJON ELECTRIC DIESEL CO.**
151 Washington St., Brooklyn, N. Y.
Main 4-3804-5

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# VALVES

INDUSTRIAL & MARINE

**METROPOLITAN**
**PLUMBING SUPPLY CO., INC.**

Power Plant Vales and Engineering Specialties for Oil, Steam, Gas, Air, Liquids and Chemicals.
Jenkins, Fairbanks, Sarco, Powell Valves and surplus.
Large Complete Stocks 1/8" to 24"
313 EAST 31st ST., NEW YORK CITY
For Hourly Nation-wide Shipments
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## ELECTRICAL EQUIPMENT

**Put it into production—if you can't we can**

**Call CANAL—6-6976**

# "LAND"

***WE ARE READY TO PURCHASE***

15 KW, 25 KW, 50 KW, 100 KW, 150 KW — MOTOR GENERATOR SETS 125 OR 250 VOLTS

10 H.P., 15 H.P., 25 H.P., 50 H.P. — MOTORS, D. C. 125 VOLTS

**Odd Voltage Motor Generator Sets All Sizes**
**A.C. and D.C. Control Equipment**
**Alternators, 900 and 1200 R.P.M.**
**All Types of Belted Generators**

***WE HAVE AVAILABLE IN STOCK***

**A. C. EQUIPMENT**

**SYNCH. MOTORS**
200 H.P. G.E. TS 514 RPM

**SLIPRING MOTORS**
500 H.P. A-C—1200 RPM
250 H.P. G.E., 600 RPM
200 H.P. G.E., 720 RPM
200 H.P. G.E., 514 RPM
125 H.P. Burke, 600 RPM
75 H.P. West., 1200 RPM (5)
64 H.P. G.E., 585 RPM
60 H.P. West., 1200 RPM
60 H.P. West., 290 RPM
(190 additional slipring motors, 1 to 50 H.P. in stock.)

**SQUIRREL CAGE MOTORS**
200 H.P. G.E., 600 RPM
150 H.P. G.E., 600 RPM
100 H.P. Cr.-Wh. 1800 RPM
100 H.P. West., 720 RPM (4)
100 H.P. G.E., 720 RPM (2)
100 H.P. G.E., 600 RPM
60 H.P. G.E., 1800 RPM
50 H.P. Allis Ch., 720 RPM
50 H.P. G.E., 720 RPM
50 H.P. G.E., 600 RPM
30 H.P. G.E., 514 RPM (2)
(310 additional squirrel cage motors in stock, ½ to 50 H.P.)

**A.C. GENERATORS**
200 KW G.E., 600 RPM
150 KW G.E., 900 RPM
150 KW G.E., 720 RPM
100 KVA West., 600 RPM
75 KW West., 900 RPM

**D. C. EQUIPMENT**

**230 V. D.C. MOTOR GEN. SETS**
150 KW G.E., 900 RPM
50 KW Burke, 1200 RPM
30 KW G.E., 1150 RPM
(18 additional sets in stock, 1 to 25 KW)

**125 V. M.G. SETS**
100 KW West., 1200 RPM
75 KW Ridgeway Syn.
50 KW West., 850 RPM
30 KW G.E., 1150 RPM
(19 additional 125 V. M.G. Sets in stock, ½ to 25 KW)

**230 V. D.C. MOTORS**
85 H.P. G.E., 880 RPM
60 H.P. G.E., 900 RPM
60 H.P. Roth, 600 RPM
50 H.P. G.E., 850 RPM
40 H.P El. Dyn., 1450/2600
40 H.P. G.E., 1700 RPM
40 H.P. Allis Ch., 1150 RPM
40 H.P. Reliance, 625 RPM
25 H.P. G.E., 1150 RPM (3)
25 H.P. West., 850 RPM (2)
25 H.P. G.E., 575 RPM
20 H.P. G.E., 1750 RPM (2)
(235 additional motors, ½ to 20 H.P. in stock)

**115 VOLT D.C. MOTORS**
90 H.P. G.E., 900 RPM
15 H.P. G.E., 1150 RPM
10 H.P. L.A., 3600 RPM
10 H.P. F.-M., 1150 RPM
10 H.P. West., 850 RPM
7½ H.P. G.E., 1750 RPM
7½ H.P. West., 1150 RPM
7½ H.P. G.E., 850 RPM
(115 additional 115 volt D.C. Motors, ½ to 5 H.P., also in stock)

# L. J. LAND & CO.

**146 Grand St., New York, N. Y.**
**10th & Exeter Sts., Reading, Pa., York, Pa.**
New York City's largest stock Electrical Equipment
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OVER QUARTER CENTURY SERVING INDUSTRY
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# SEARCHLIGHT SECTION

1—400 HP Westinghouse, type CW, 3ph, 60cy, 440V, 450 RPM slip ring motor

1—300 HP Westinghouse, 3ph, 60cy, 440V CW slip ring motor 495 RPM

2—250 HP Westinghouse, type CS1012, 3ph, 60cy, 440V, 435 RPM Sq. Cage

3—250 HP General Electric, 3ph, 60cy, 440V I-17A 400 RPM

1—200 HP Westinghouse, syn. IPF 3ph, 60cy, 2200V, 600 RPM with direct connected exciter 3 or 2 bearing

1—200 HP Westinghouse, 3-60-440V, CW 1160 RPM slip ring

1—200 HP Allis Chalmers, 3-60-440V, 514 RPM

2—150 HP Allis-Chalmers, 3ph, 60cy, 440V 450 RPM slip ring

1—150 HP General Electric type KT, fr. 558 3-60-2200V, 880 RPM

1—150 HP General Electric type ATI, 3-60-440V 900 RPM .8PF

2—125 HP Westinghouse CS774C 3-60-440V 860 RPM ball bearing

2—75R, 2200V Fairbanks-Morse, 1800 RPM, 3ph 60cy, slip ring motors direct connected to 500 GPM 3 stage 300 head pump

4—100 HP General Electric, 3-60-440V 495 RPM, MT562 slip ring

1—100 HP General Electric KT fr. 556 3-60-440V, 875 RPM

1—100 HP General Electric type I, form K, 3-60-220V 575 RPM

1—100 HP Westinghouse, type CCL, 3ph, 60cy, 2200V 1750 RPM Sq. Cage

1—100 HP Allis-Chalmers, type ANY, 3ph, 60cy, 220V 690 RPM slip ring

1—75 HP Allis-Chalmers, 3ph, 60cy, 440V 450 RPM slip ring

1—75 HP Westinghouse, type CW, 3ph, 60cy, 440V 720 RPM slip ring, 3 or 2 bearings

1—75 HP General Electric, type MT, frame 558, 3ph, 60cy 440V 575 RPM

1—60 HP General Electric type MT, frame 346, 3ph 60cy, 440V 870 RPM

1—75 HP Fairbanks-Morse, type H, frame 165C 3ph 60cy 550V 900 RPM Sq. Cage

1—75 HP Lincoln, type IQ, 3ph, 60cy, 440V 600 RPM Sq. Cage

1—75 HP Reliance, 3ph 60cy, 440V 720 RPM totally enclosed fan cooled

1—75 HP Allis-Chalmers, 3ph 60cy 440V 600 RPM slip ring

1—75 HP General Electric 3ph 60cy 440V 600 RPM, MT558 slip ring

1—100 HP Westinghouse, type SK, frame 160, 230V, 1100 RPM

1—100 HP General Electric, type CD fr. 123, 230V 1200 RPM

1—100 HP General Electric, type RF 17, 230V 400/1200 RPM

1—50 HP Westinghouse, type SK, fr. 160, 230V 565 RPM

1—50 HP General Electric, class 5 Form B, 600V, 600 RPM

1—50 HP Westinghouse SK200 245 RPM 230V

1—100 HP Westinghouse type SK, frame 140 230V 1700 RPM

1—60 HP Westinghouse, type SK, frame 160, 230V 680 RPM

1—75 HP General Electric, type CD fr. 176 550V 250/1000 RPM (planer)

2—40 HP C & C 230V, 250/1000 (planer)

**The Wente Electric Co.**

HAMILTON, OHIO

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POWER PLANT, with 2, 300 H.P. Boilers complete with 2, 500 KW, 3/60/2300 Turbines and Generators.
2—300 H.P. Water Tube Boilers
1—483 H.P. 160# Stirling W. T. Boiler
1—500 H.P. 150# Scotch Marine Boiler, twin fire boxes

**COMPRESSORS**

526 C.F.M. Ingersoll-Rand, belt drive
1750 C.F.M. I-R with 300 H.P. motor
1050 C.F.M. Chi. Pneu. Type OCB with 150 H.P. A.C. motor

**ELECTRIC MOTORS**

30 Units 15 to 75 H.P., squirrel cage, 3/60/440 A.C.
15 Units 3 H.P. to 60 H.P., 230 V D.C.
We also have on hand miscellaneous electrical items such as: Oil Switches, Oil Circuit Breakers, Lighting Generators, Compensators.
(Write for our Electrical List)

**GENERATORS**

200 KW West. #201 SK, comp. wound, 600 V. D.C. with 290 H.P. syn. motor, 3/60/2200, 900 RPM
300 H.P. Buckeye Diesel Engine & Gen. 3/60/240.
500 KW G.E. Skinner Uniflow Steam Eng. Gen., 250 V. D.C.
100 KW G.E. Type ATB-2-1250-3600 Form T, 814 amps, 3/60/2200-900 RPM
5000 KW Turbo Generator, 3/60/2300 3600 RPM, 185# W.P.
POWER PLANT—Complete with two 625 KW Turbo Generators 3/60/2300, complete with 309 H.P. each Heine Water Tube Boilers, 225# steam pressure

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25 to 60 cycles.
60 cycle unit, 4150 V
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Complete with Starting Equipment.

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Superior Iron Works single drum, 36" dia., with 80 H.P. G.E. type MTC motor
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3 Single phase, 2300 Volt Transformers 1—DC and 1—AC panel for above.

2—1000 KW., Westinghouse compound interpole 250 volt DC, 6 phase, 60 Cycle AC Rotary Converter 900 RPM.
2—Banks of 3 Single phase, 2300 volt transformers for above and 2—DC and 2—AC panels.

*The above in excellent condition.*

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2—Lecourtenay horizontal slit case 4000 GPM against 170' hd., 1750 RPM centrifugal pumps each direct con. to 200 HP 3/60/208 vt. induction motors mounted on common cast iron base—used but little—excellent condition—attractive price for immediate shipment.

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volts DC generators
and MG sets in stock
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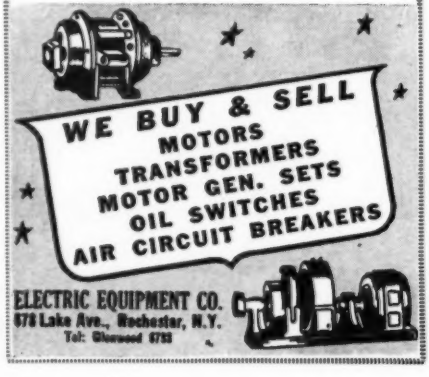


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4—750 H.P. Edgemoor WASTE HEAT BOILERS. All ASME, last insured for 200 lbs. working pressure. Including superheaters, economizers, fuel fans, boiler feed pumps, steel stacks, feed water heater, etc.

All in one installation and in good operating condition.

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# SEARCHLIGHT SECTION

## POWER EQUIPMENT FOR PROMPT SHIPMENT

### SQUIRREL CAGE MOTORS (3 ph. 60 cy.)

| HP | Make | Volts | Speed | Type |
|---|---|---|---|---|
| 700 | G.E. | 6600 | 1800 | |
| 150 | West. | 220/440 | 580 | CCL |
| 125/40 | Cr. Wh. | 2200 | 700 | 125AQ |
| 125 | Burke | 220/440 | 1200 | |
| 125 | Cr. Wh. | 2200 | 700 | 125AQ |

### DC SERIES & CPD. MOTORS

| HP | Make | Type | Speed |
|---|---|---|---|
| 2 | R & M | 122 | 1000 |
| 5 | R & M | 125 | 1000 |
| 15 | West. | | 650 |
| 25 | Shaw | | 600 |
| 50 | Shaw | | 600 |
| 100 | G.E. | MD 108 | 480 |
| 130 | G.E. | CO 1812 | 550 |
| 175 | G.E. | MDS 190¼ | 475 |
| 200 | Allis | Interpole | 600 |

### SYN. MOTORS, 3 ph. 60 cy.

| HP | Make | Volts | Speed |
|---|---|---|---|
| 75 (2) | G.E. ATI | 2200 | 900 |

### SLIP RING MOTORS, (3 ph. 60 cy.)

| HP | Make | Volts | Speed | Type |
|---|---|---|---|---|
| 1000 | Al. Ch. | 440 | 235 | |
| 700 | G.E. | 2200 | 393 | MT 432 |
| 300 | G.E. | 440 | 600 | I-M |
| 200 | G.E. | 2200 | 240 | MT 412 |
| 150 | G.E. | 220/440 | 720 | I-M |
| 150 | Al. Ch. | 2200 | 685 | |
| 150 | G.E. | 220 | 575 | I-M |
| 125 | Al. Ch. | 2200 | 435 | |
| 100 | Al. Ch. | 220/440 | 575 | |
| 100 | G.E.-25 cy. | 220/440 | 500 | MI-108 |

### "Wound Rotor Motors" (3 ph. 60 cy.)

| HP | Make | Volts | Speed | Type |
|---|---|---|---|---|
| 200 | G.E. | 2200 | 600 | I-L |
| 150 | G.E. | 2200 | 600 | I-L |

### TRANSFORMERS

| Qu. | KVA | Make | Voltage |
|---|---|---|---|
| 3 | 37 | West. | 4400/185 |
| 3 | 50 | G.E. | 22000/2200 |
| 3 | 75 | G.E. | 2300/110/220 |
| 3 | 100 | Uptegraff | 440/220 |
| 1 | 150 | G.E. (3 ph) | 2080/230/460 |

### OIL ENGINE DRIVE AIR COMPRESSORS

Chicago Pneumatic simplate valve type, N503 straight line 16½ & 11 x 18" capacity 492 cu. ft. displacement, 100# pressure, with air receiver and starting air compressor.

2—14x10" Sullivan 505 cu.ft. compressors

1—10x12 Ch. Pneu. 164 cu.ft. steam compressor

### M-G SETS 3 ph. 60 cy. (Syn)

150 KW West. 550 v. DC—2200 AC 1200 RPM
150 KW Ridg. 250 v. DC—2300/3/60 AC

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1—1 Ton Sprague 230 v. DC
2—2 Ton Sprague 230/500 v. DC Monorail

*In addition to the above, we have hundreds of other items in stock—kindly send us your inquiries.*

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*IF YOU DON'T KNOW MACHINERY—KNOW YOUR MACHINERY DEALER*

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## COMPLETE POWER PLANTS

### TURBO-GENERATORS—CONDENSING

1—7500 KW G. E. Co., 60-3-5000 V
2—5000 KW G. E. Co., 60-3-2300 V
1—5000 KW Westinghouse, 60-3-2300 V
1—4000 KW G. E. Co., 60-3-2300, 4000 V
1—3200 KW Allis-Chal., 60-3-2300, 4000
1—2500 KW G. E. Co., 60-3-2400, 4000
1—2500 KW G. E. Co., 60-3-2300
1—2000 KW Westinghouse, 60-3-480 V
1—2000 KW G. E. Co., 60-3-600 V
1—2000 KW G. E. Co., 60-3-2300 V
1—1500 KW Westinghouse, 60-3-2300
1—1250 KW G. E. Co., 60-3-2300
3—1000 KW G. E. Co., 60-3-2300
2— 750 KW G. E. Co., 60-3-2300
2— 520 KW G. E. Co., 60-3-2300
Also 1—200 and 1—300 KW Tubes.

### TURBO-GENERATORS—NON-CONDENSING

1—2000 KW G. E. Co., 60-3-480
1—1200 KW Terry, 60-3-480
2—1000 KW G. E. Co., 60-3-480
1—1000 KW Allis Ch., 60-3-2300
1— 750 KW Westinghouse, 60-3-480 350# 100# EXHAUST
1—750 KW Westinghouse, 60-3-2300
Also some smaller units

### BOILERS

1—1250 HP Keeler, 175#
1—1000 HP B & W 200#
4—1000 HP Heine 250#
4— 750 HP Edgmoor 200#
2— 500 HP Edgmoor 150#
4— 620 HP Badenhausen 160#
Smaller boilers on application.
Surface Cond. 3600 sq. ft. to 12000 sq. ft.

**CHARLES B. REARICK** — **30 Church St., New York**

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250 KW 125 V. 320 RPM with 4 CYL. 11 x 12 VERTICAL Uniflow engine.
NEW 400 H.P. 4 CYL. 11 x 10 VERTICAL Uniflow engine.
2—566 H.P. B. & W. 200# Code straight tube coal fired boilers.
75 KW D.C. Gasoline engine set, factory job.
75 KW 125 V. Syn. Motor Generator set, also 250 V. set same size.
80, 150 H.P. Portable Boilers.
50 KW GE Marine 3 wire set.
200 KW Skinner Uniflow engine set, 125 or 250 V. as wanted.
Turbos, M. G. sets, transformers.

*Send your lists of equipment.*

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562 HP Edgemoor 200# water tube
2—320 HP 150# B & W Stirling, 360 C. F. M. 100# Chicago Pneumatic Compressor, idler, tank & motor.

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## FOR SALE

1—50,000 Gallon Tank & Tower
1—2000 Amp. Plating Generator
1—60 KW Belted Generator—A.C.
2—500 HP, 200# W. T. Boilers
1—312 KVA 240 V. AC Gen. D/C Corl.
1—75 Ton, 65' Span O.E.T. Crane
1—25 to 150 HP Diesels—All Sizes

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## WE SELL — PURCHASE — RENT

Power & Dist. Transf. from one to 5000 KVA. Any Volt or Frequency.

Motors, Generators, Turbines, Centrifugal Pumps, etc.

A.C. & D.C. Elec'l Meters. Potential & Current Transf. All Makes. Scales Calibrated to your requirements.

*Catalog & Prices on Request*

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### IMMEDIATE DELIVERY

1—1200 KVA Diesel Plant 6 cyl. 3/60/208
2—300 KVA Fairbanks 6 cyl. 3/60/208
4—250 KVA Worthington 6 cyl. 3/60/208
2—250 KVA Buckeye 8 cyl. 3/60/480
1—100 KW Alco D.C. Set 5 cyl. 250v. D.C.

**ROBERT SCHOONMAKER**
Diesel Sales Engineers
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2—Single set, 200#, Stirling, 500 H.P.
2—battery set, Heine, 250 H.P. 160#
3—78" x 20' HRT, 150#, suspended
2—72" x 18' HRT, with stokers
3—Type-E, side dump stokers, 78" wide
1—625 K.W. (bleeder) turbine

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## FOR SALE

1—35 K.W. 3 phase, 60 cycle, 550 volts, *Star Generator*, 1800 RPM, direct con. to Hercules 6 cylinder Diesel engine.
1—Sims Company Heat Exchanger from 500 to 700 H. P.

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PLUMBING SUPPLY CO., INC.
INDUSTRIAL AND MARINE SUPPLIES
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1—5000 KW G. E. condensing.
1—3200 KW Allis-Chalmers condensing.
1—2500 KW G. E. condensing.
1— 500 KW West. condensing.
1— 300 KW G. E. non-condensing.

## TRANSFORMERS

**Single Phase, 60 Cycle**

3—150 KVA Pittsburgh, 6600/220-440 V.
3—100 KVA G. E. 13,200-6600/2200 V.
2— 75 KVA West. 2200/110-220 V.
2— 75 KVA West. 6600/230-460 V.
2—37½ KVA Pittsburgh 2200/220-440 V.

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1—Westinghouse CS, 500 HP, 450 rpm, AC motor. Needs rewinding. Will rewind to any speed and voltage within capacity of frame.
1—G. E. slip ring motor, 1-15A, 125 HP, 600 rmp, 440-3-60, rebuilt.
3—G.E. Transformers, 37½ KVA, 22000/115-230 volt, 1 ph. 60 cy.
1—400 amp. DC welding M-G set, 440-3-60 supply voltage.

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**JACKSON BAYLEY ELECTRIC COMPANY**
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## 1200# Pressure Air or Gas Compressor

Worthington, horizontal, three-stage, steam-driven. Formerly used for $CO_2$.

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300 KW. Motor Generator sets

750 HP Boiler, 250#, complete

3000 KW. Turbo unit, AC, Condensing

600 cu. ft. Diesel Compressors

DIESEL Plants from 7 KW. to 1200 KW.

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**FIRE TUBE BOILERS**
*(NEW OR USED)*
**ONE WEEK'S DELIVERY AFTER RECEIPT OF ORDER**

Sizes from 50 H.P. to 125 H.P., 50# W.P. to 350# W.P., Oil, Gas or Coal Fired, Shaker Grates or Stokers, Hartford or Oklahoma approved Certificate.

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**FOR SALE**

1535 HP Diesel Engine, Marine—Direct Reversing, Solid Injection—Type M9Vu—Manufactured by the Electric Boat Corporation, New London, Conn. Navy Specifications—Like New. Has had very little Service.

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Power plant equipment. Steam, Diesel, electrical, boilers, engines, turbines, generators new or used.

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COCHRANE OPEN TYPE BOILER FEED WATER HEATER OF APPROXIMATELY 25 H. P. AND EQUIPPED WITH TRAYS.

FS-510, Power
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Two 250 H.P. Steel supported H. R. T. boiler certified for 150 lb. S. W. P. complete with all trim outlet valves and piping.

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Reducing, Thermostatic, back pressure, Electric operated, Ammonia, Gate & Globe.
Feed Water Heaters, 2" Feed Water Filter, 2" new Injector, Steam & Oil Separators.

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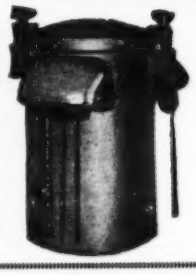

**TRANSFORMERS WANTED**

in operating condition or burnt out. Mail us list giving complete nameplate data and stating condition.

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**ALL TRANSFORMERS GUARANTEED FOR ONE YEAR**
**We will be pleased to quote prices on request.**

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1—200 KW M. G. Set 250 DC—220/440 AC, 60 cycle
1—150 KW M. G. Set 250 DC—220/440 AC, 60 cycle
4—40 HP—1200 rpm—440 volt, 60 cycle squirrel cage Ind. Motors.

**H. BLAINE JOHNSON**
53 W. JACKSON BLVD, CHICAGO, ILL.

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Westinghouse Air Circulators. Other models, makes. Immediate delivery.

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**DIESEL ELECTRIC SETS**

Two used full Diesel Electric Sets each four or five hundred KVA three phase sixty cycles twenty-three hundred volts. Give complete description and price crated.

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**DIESEL GENERATOR UNIT**

500 HP Diesel Generator Unit suitable factory Power Plant. Will consider two or three Units also bare Engines. Furnish full details.

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1500 K.W. Steam Turbine Generator Plant. Complete in every way. Same as new.

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**HYDRAULIC TURBO-GENERATOR**

Preferably 110 foot head, 5000 K.W., 3 phase, 60 cycle with switchboard, etc. Will consider offers of any part or anything over 2500 K.W.

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**HEINE BOILER**
600 H.P. 3½ x 18 Tubes, 2 Drums
**TURBO-GENERATOR**
500 K.W. Westinghouse A. C.
High Pressure, 3 Phase, 60 Cycles
600 Volts with Exciter
**ALICE BLDG., INC.**
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**WANTED:** Boilers 250 to 800 HP 200# pressure. Must be stamped code.
**FOR SALE:** 500 HP 250# sectional header 675 KVA Nordberg Uniflow A.C. condensing or non condensing.
100-200 KW Chuse N.R.C. 250 volt D.C. engine generators.

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WANTED

**STEAM TURBINE GENERATOR**

5000 KW Steam Turbine generator 350 lb. pressure in 1 or more units with auxiliary equipment. Generator to be 3 ph. 60 cy. preferably 2300 v. also Boiler Plant.

W-541, Power
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**BOILERS**

2—250 H.P. Murray Water-tube Boilers, complete with all fittings and rocker hand-dump grates and suspension irons, ready for installation for 165# pressure.

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W-528, Power
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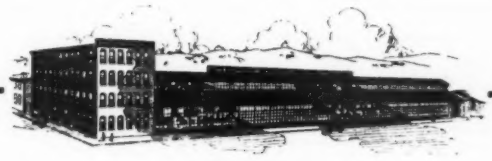

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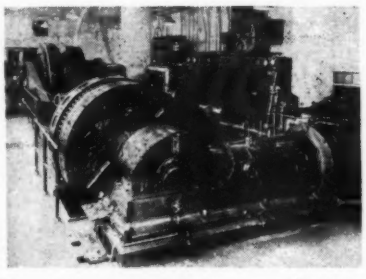
## Complete Power Plant



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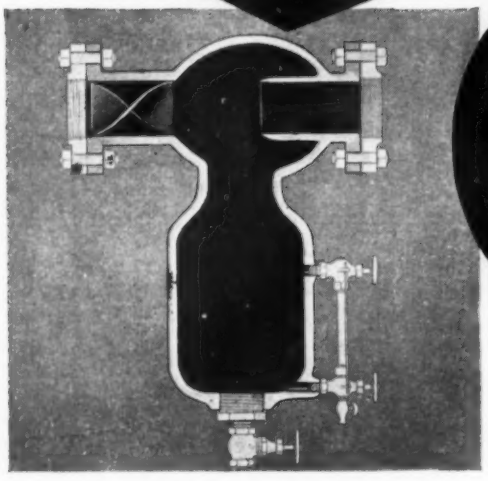
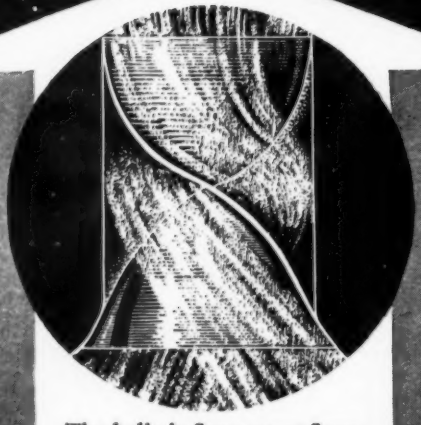
# The Whirl Does the Trick

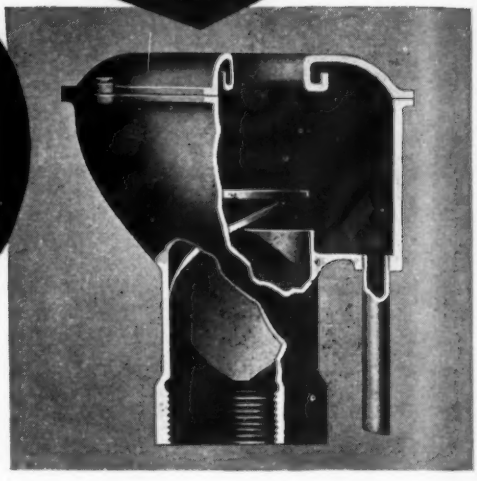
of purifying your steam & oil through **Swartwout Separators**

of drying exhaust steam through **Swartwout Exhaust Heads**





The helix in Swartwout Separators and Exhaust Heads gives the entering steam a *positive whirling motion* that throws aside all impurities.



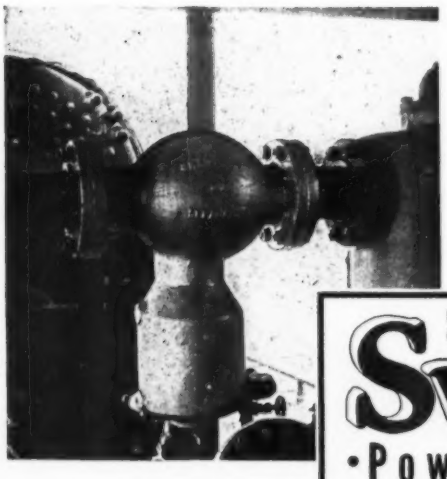
NO SLUGS OF WATER CAN SLIP THROUGH Swartwout Separators to ruin your engine or turbine; no dirty oil or grease to spoil work in process or gum up pipes and machinery. This high degree of separation is gained with practically no pressure drop. Nothing impedes the progress of the vapor being purified. Swartwout Separators are made in vertical and horizontal styles, and in a dozen sizes. Also highly efficient Air Purifiers.

Write for Bulletin S-14-B.

★

SWARTWOUT CAST IRON EXHAUST HEADS were the first to replace the unsubstantial sheet metal heads that were quickly destroyed by corrosion. The same helico-centrifugal principle as used in Swartwout Separators works as efficiently in the Exhaust Heads to remove oil and water from exhaust steam, thus preventing the damage these substances cause to roofs and side walls of your buildings. Made in a wide range of sizes.

Write for Bulletin S-16-A.



## The Swartwout Company

**18501 Euclid Avenue • Cleveland, Ohio**

★

*Swartwout Separator purifies steam used in feed water heater at Patsy Oil Company, Oklahoma.*

*Swartwout Exhaust Head in use at Dominion Coal Company, Glace Bay, Nova Scotia,*

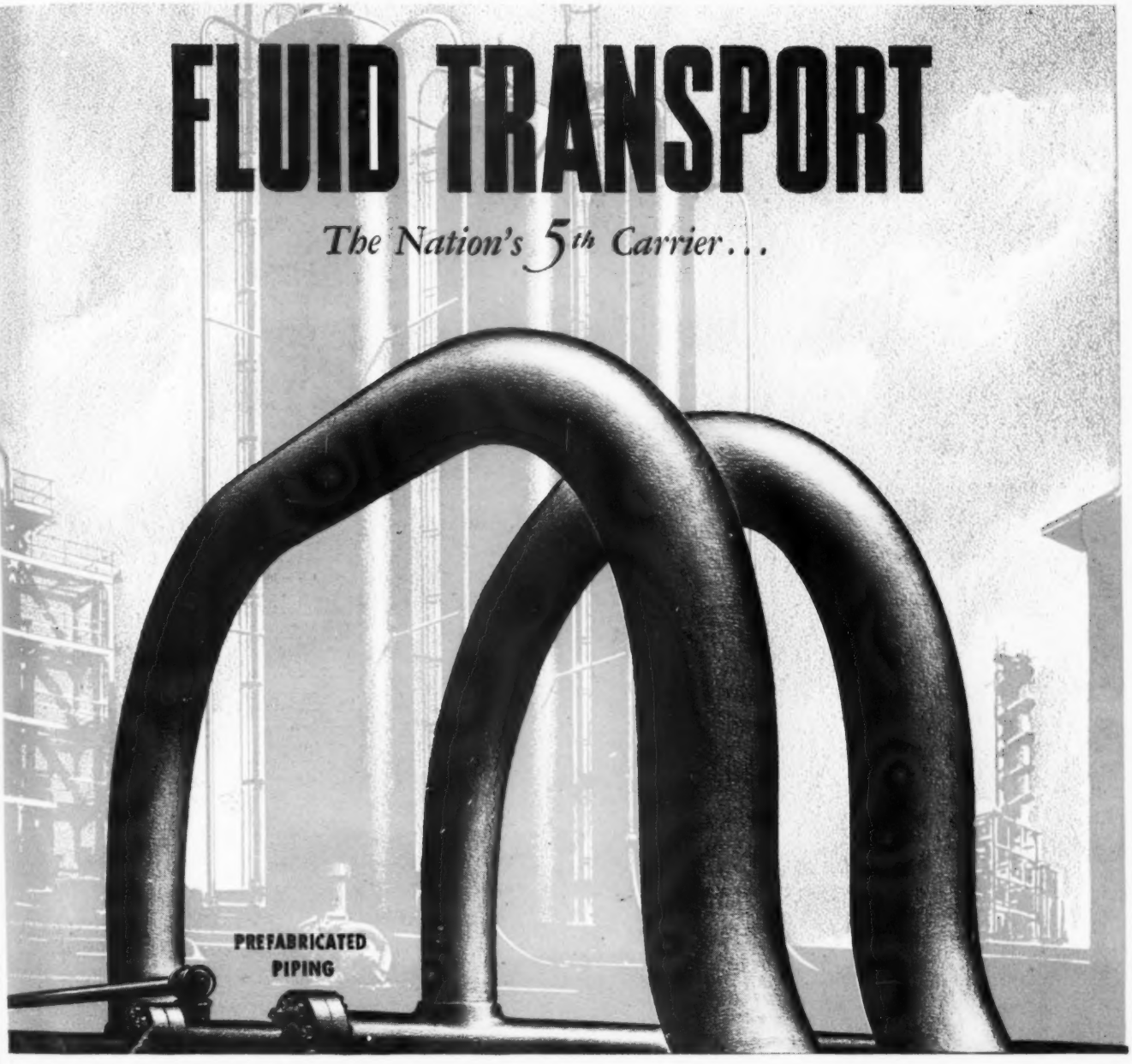
Feed Water Regulators • Pump Governors • Feed Water Heaters
Master Controls • Reducing Valves • Separators • Exhaust Heads

**Swartwout**

**•Power Plant Equipment•**

# FLUID TRANSPORT

*The Nation's 5th Carrier...*




**REMOVE THE PIPING FROM A PETROLEUM REFINERY** and what have you left? From well to tank car an unfathomable maze of piping provides FLUID TRANSPORT.

Here, as in scores of other industries, the piping formula is made up of such components as: materials to be carried, heat, cold, expansion, contraction, pressure and corrosion. Grinnell provides the specialized engineering combined with the manufacture and fabrication of the many connecting links needed to convert a pile of pipe into a complete *piping system.*

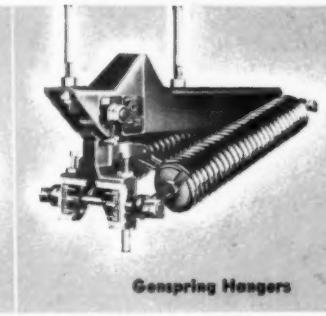
For war construction, or maintenance and repair of existing piping, call Grinnell Company, Inc. Executive offices, Providence, R. I. Plants and offices throughout United States and Canada.

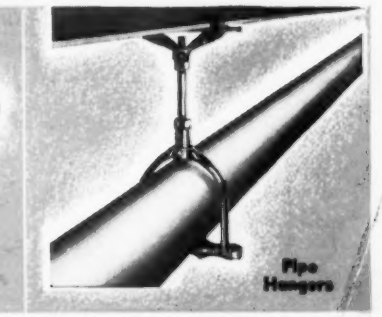
# GRINNELL

**WHENEVER PIPING IS INVOLVED**

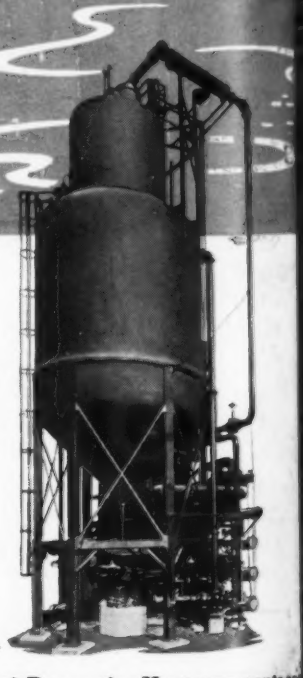
Grinnell Saunders Diaphragm Valves

Pipe and Tube Fittings


Genspring Hangers


Pipe Hangers

# You'll never win an "E" with a boiler absentee



## GOOD WATER keeps boilers on-the-line

BADLY needed tools of war must wait while scaled or corroded boilers are down for repairs. Impurities in the feedwater are to blame. Permutit* prevents these troubles by removing the impurities before the water enters the boilers. For instance, one plant reports: "We formerly had to re-tube boilers every three years, but since installing Permutit six years ago we haven't touched them as they're good as new."

Permutit's products include Zeo-Karb*, the zeolite that can be operated on the hydrogen or sodium cycle, hot lime soda softeners, deaerating heaters, silica removal and continuous blowoff equipment. A new process produces the practical equivalent of distilled water at a small fraction of the cost of distillation. Write us about *your* boilerfeed problem: The Permutit Company, Dept. A, 330 West 42nd Street, New York, N. Y. In Canada: Permutit Company of Canada, Ltd. . . . Montreal . . . Toronto . . . Winnipeg . . . Calgary.

*Trademark Reg. U.S. Pat. Off.

**Permutit Deaerating Heater prevents co rosion.** It's guaranteed to remove all oxyg (Winkler test) and free $CO_2$ from feedwat Utilizing exhaust or bled steam, it is designe for pressures up to 100 pounds or highe capacities up to 1,400,000 pounds per hou

# PERMUTIT

SERVING INDUSTRY AND THE ARMED FORCES WITH GOOD WATER